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# **CONSTRUCTION INDUSTRY SAFETY CULTURE**

## **A COMPARATIVE STUDY OF BRITAIN AND THE CARIBBEAN**

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UNIVERSITY OF ASTON  
CONSTRUCTION INDUSTRY SAFETY CULTURE: A COMPARATIVE  
STUDY OF BRITAIN AND THE CARIBBEAN

STEPHEN JOHN PECKITT

Doctor of Philosophy  
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**SUMMARY**

This cross cultural study of safety culture examines occupational health and safety related attitudes and safety management practices in the construction industry in the anglophone Caribbean and Britain using both quantitative and qualitative techniques derived from the social sciences. This cultural study combines elements of the dichotomous perspectives which prevail in the literature relating to organisational culture (Waring and Glendon, 1998). Documentary and observational information is combined with the results derived from attitude scales and audits of site behaviours and management systems to produce a holistic and triangulated analysis of safety culture.

Bandura's (1977, 1986, 1991) *Social Cognitive* theory of provides the conceptual framework for this study, highlighting the triadic and reciprocal nature of the relationship between cognition, behaviour and environment. Cognitive issues such as risk perception, locus of control, accident causation beliefs and safety management responsibilities are explored. Behavioural factors are examined by combining the evidence derived from site safety auditing, safety management systems appraisal and structured interviews. The environmental or situational factors which affect an organisation's health and safety performance are studied by an examination of occupational health and safety legislation, its enforcement, the tripartite process and societal values.

Accident and ill-health data for the construction industry suggest that the comparatively highly developed societal safety management systems of legislation, inspection and consultation in Britain have not resulted in lower rates of death and ill-health compared with the Caribbean. This study highlights the importance of the influence of societal culture, the construction process and local environment upon safety culture in the construction industry. This research demonstrates that the safety culture paradigm is not just a catch all phrase or label for best practice, but is a holistic way of thinking about risk management which allows the identification of underlying causal factors behind safety performance in complex socio-technical systems.

**Key Words:**

ACCIDENT CAUSATION; HUMAN FACTORS; RISK;  
SAFETY CLIMATE; SOCIO-TECHNICAL SYSTEMS

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## **Dedication**

This work is dedicated to the memory of my father, Herbert Francis Peckitt, who died in 1999 at the age of 68 from throat cancer having been weakened previously by a heart complaint and a lifetime of employment as a carpenter.

## **Acknowledgements**

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# Chapter One: Introduction

*"... building a wall involves physical and material factors, but it could not take place outside a system of meaning, institutionalised cultural knowledge, normative understandings and the capacity to conceptualise and use language to represent to oneself the task on which one was engaged and to build around it a collaborative and communicative 'world' of meanings - in short, 'a culture'. Hall (1997a) p.232*

The disasters at Chernobyl and Bhopal in particular, led to the concept of safety culture becoming a new paradigm in safety management thinking. It is ironic that these catastrophic failures of processes at the apex of modern technological culture spurred the growth of the concept of safety culture which puts the human condition at the centre of the analysis. The concept has become increasingly important in the last decade, being cited in numerous publications, including CBI (1990), Waring (1992), HSC (1993), Lee (1993), Geller (1994), Guest, *et al.* (1994), Meshkati (1995), Rosen (1995), Reason (1997), Pidgeon (1998a), Cox and Flin (1998), Cooper (1998) and IAEA (1998). This chapter summarises the aims of this study of safety culture in the construction industry, defines key terms, and details the research plan followed.

In most societies, the construction of structures is integral to human activity providing, *inter alia*, places for shelter, business, religious ceremonies and learning. The construction industry produces the built environment, creates employment and generates wealth. Small businesses specialist in one of numerous different construction related activities, dominate the industry resulting in a competitive, complex, dynamic and fragmented industry. The construction industry is commonly considered to be dangerous, difficult and dirty, and is one of the most hazardous land-based industrial activities producing large numbers of serious accidents and cases of ill-health to workers and members of the public.

This research aims to explore the safety culture of the construction industry in two different societies to identify key similarities and differences that could help improve our knowledge of construction safety culture and help improve



risk management in the industry. This work was prompted by the author's experience of the construction industry, including employment as an Inspector with the Health and Safety Executive (HSE) specialising in construction for over ten years, as a materials scientist, a builder's labourer and the son of a carpenter. During visits to the Caribbean and living in London, the researcher mixed extensively with the African-Caribbean Diaspora. HSE facilitated this work by providing a travelling grant, special unpaid leave for two years, and the opportunity to undertake health and safety auditing on the Jubilee Line Extension Project (JLEP).

This work was undertaken on a part time basis in the Caribbean, as part of a specific operational project as a HSE inspector in Britain and written up in the author's spare time whilst remaining in full time employment. The original research plan was to audit similar kinds of sites in Britain and the Caribbean. However, working as a HSE inspector placed constraints on the British aspects of this research as it limited the geographical spread and type of construction sites visited, frequently made site managers on medium sized sites nervous about participating and allowing time to conduct interviews, and restricted the time available to devote to this study. The author was assigned to inspect the JLEP, the largest civil engineering project in the country at the time, and given permission to conduct safety culture audits of several major contracts. This prompted the alteration of the site audit tool and the development of a safety management audit system. The methodology provides further details of the work undertaken, the constraints experienced, methods adopted and demonstrates the comparability of the two data samples.

This thesis examines the key cognitive, behavioural and situational factors that characterise the safety culture in the construction industry in the anglophone Caribbean and Britain. As the work progressed and findings evaluated, it became progressively clearer that the explanation for the experimental findings could not be found in terms of conventional wisdom's of safety management, nor could it be fully explained by invoking a functionalist

organisationally-biased concept of safety culture. A full explanation for the findings was achievable via consideration of contemporary beliefs about how life should be lived and the nature of work. This offered insights into the impact of societal culture on safety performance. The implications go well beyond traditional 'narrow' explanation of differences in approaches to construction safety.

## **1.1 Research Objectives**

The aim of this project was to examine the health and safety risk management in the construction industry in two different parts of the world to gain a better understanding of the factors that significantly impact upon the safety culture of the industry. This cross-cultural research project focuses on safety specific cognitive, behavioural and situational factors characteristic of the industry in Britain and the Caribbean in the last decade of the twentieth century. The specific objectives set for this study were to examine:

1. construction site safety standards;
2. construction worker attitudes to safety;
3. construction companies safety management practices;
4. the impact of societal factors upon safety culture.

A review of previous research on safety in the construction industry identified a number of instruments suitable for assessing different aspects of safety culture in the industry, which were adapted for use in this study. Attitude scales, interview schedules and safety audits were used in Britain and the Caribbean to gather information about the respective safety cultures.



### ***1.1.1 Research Plan***

This study involved four main phases: background research and proposal formulation; Caribbean fieldwork; British fieldwork; literature update and report writing.

#### *Phase 1: Background research*

1. review of literature;
2. research proposal formulation and approval;
3. data collection tool identification and formulation;
4. requests for assistance and co-operation.

#### *Phase 2: Caribbean fieldwork*

Countries selected on the basis of:

1. co-operation of the Labour Ministry/Factory Inspectorate;
2. sufficient number, size and type of active construction projects;
3. co-operation of local companies.

Stage 1: On arrival in each Caribbean country contact Factory Inspectorate/Labour Administration Department to:

- ♦ interview officials and inspectors regarding their work;
- ♦ review the current legislative framework;
- ♦ accompany inspectors on visits;
- ♦ discuss local issues, including tripartism;
- ♦ obtain accident data.

Stage 2: Contact construction companies to:

- ♦ interview directors and site managers;
- ♦ undertake site safety audits;
- ♦ interview site workers;
- ♦ assess the role of subcontracting;
- ♦ obtain employment and accident data.

Stage 3: Contact trade unions and employers organisations to:

- ♦ assess their role and input in promoting safety awareness;
- ♦ discuss health and safety issues;
- ♦ interview union representatives and members;
- ♦ obtain current membership data.

Meetings took place with representatives of construction companies, Labour Ministries, the Caribbean Labour Advice Centre, CARICOM, trade unions, employers organisations and the University of the West Indies (UWI).

Attitudes scales, interview schedules, questionnaires and aide memoires were used during interviews, while a site safety audit tool was used to assess site safety standards. Verbal reports of the preliminary findings were given to all

interested parties. The emerging results from the Caribbean fieldwork were presented to a meeting organised by the UWI's Civil Engineering Department in Trinidad. In Jamaica the author conducted training courses for inspectors and managers, and presented a paper at the AGM of the Jamaican Association of Safety Professionals.

*Phase 3: British fieldwork*

On return from the Caribbean, whilst employed as an Inspector with the HSE, conduct comparative:

1. site safety auditing;
2. worker interviews and safety climate scales;
3. safety management system audits.

The British phase of the work focused on the London Jubilee Underground Line Extension Project. This multi-million pound underground railway project involved a design and management team of over 1,000 staff and a total work force of around 3,500 in 1995. While this project greatly exceeded the scale of Caribbean projects studied, it is argued later that similarities in the construction process, the division of project into many separate contracts run by large civil engineering contractors, the presence of common site hazards and the historical commonality of societal systems for health and safety ensure the validity of comparative analysis.

*Phase 4: Literature review update and report writing*

1. review of relevant legislative changes;
2. review of the literature and the construction trade press;
3. contact and discuss research issues with academics and other health and safety professionals;
4. present findings at colloquia and other meetings to interested persons from HSE, academia and industry;
5. thesis writing and submission.



## 1.2 Discussion of Key Terms

### 1.2.1 Safety

Conceptual difficulties arise when trying to define safety and risk. The common parlance definition of safety is *the absence of accidents*, which is both negative and passive (Leather, 1988). The Oxford English Dictionary of Current English (1987) and International Labour Organisation (1985) define safety as "freedom from danger" where danger equates to risk. The Health and Safety Executive (1991) define risk as "the likelihood that a specific undesired event will occur due to the realisation of a hazard", and hazard as "something with the potential to cause harm, including ill health and injury; damage to property, plant, products or the environment; production losses, or increased liabilities".

Everyday, in every society, people interact with risks to their physical and material well-being. The act of survival involves activities that are laden with risks, from climbing trees for fruit, crossing a road to go shopping, ploughing a field or making a plate. The risks these activities pose may or may not be: accepted; avoided, controlled, or perceived. Few of the myriad risks humans face are realised at the individual level due to chance or human agency at the individual, group or societal level.

Much of the industrial health and safety literature is written from the functionalist perspective, based on the premise that safety is the antithesis of risk (Rochlin, 1999). If safety is the absence of risk, and risk is the possibility of loss, there should be no debate about what is safe and what is not. If, in a given situation, there is any degree of the risk of loss, then the situation is not safe by definition. However, the human experience is that we cannot live without risk, therefore functionalist definitions of safety are utopian because they imply absolute, unconditional or ideal situations that do not in fact exist (Abeytunga, 1978).

People's risk related perceptions and behaviours are primarily socially and culturally defined (HSC, 1993). Safety is therefore a dynamic social construct formed in the dynamic interplay of human, environmental, economic and technological factors (Rochlin, 1999). Safety is linked to learned responses to risks present in an environment at a particular time (Douglas and Wildavsky, 1982). Neolithic Egyptian sickles demonstrate that since humans first started to use tools, they were designed to minimise the risk of injury and discomfort (EEC, 1990). Industrial accidents are the *strange fruits* of the socio-technical system (Larson, 1983). The domination of the safety and risk literature by the functionalist, engineering biased perspectives limits its applicability to socio-technical systems (Rochlin, 1999).

### 1.2.2 Culture

Culture has three common meanings, namely: growth of things in the agricultural sense; refined understanding in the elitist sense; and the customs of a people at a particular time in the relativistic sense. Edward Tylor (1832-1917), one of the founders of social anthropology, defined culture as the complex whole of knowledge, belief, arts, morals, law, custom and any other capabilities and habits acquired by people as members of a society (Jenks, 1993). Current anthropological definitions of culture centre on what people collectively do in their different ways, in different places and at different times. Culture is the product of individual and group values, attitudes, perceptions, and patterns of behaviour developed in the environment which they inhabit. Culture is partly unconscious, learnt through experience, historically based, heterogeneous and is both an input to and an output of the human condition (Williams, Dobson and Walters; 1989).

Each society works out specific ways of handling life's universal problems, such as nutrition, shelter and reproduction, which are passed from generation to generation. The characteristics of a particular culture largely determine the experiences a person has (Morgan and King, 1971). Every society has distinctive sets of values and priorities within its culture giving guidance on



how its members should proceed (Ng, 1980; Haralambos and Holborn, 1991). Expressions of culture include observable artefacts, patterns of behaviour, values and assumptions (Rousseau, 1990). Culture is about human experience and interaction, and is therefore complex and chaotic. Macro aspects of culture, located at the societal level, include language, laws, rituals and world views, while micro aspects, eg motivation, trust and violations are located at the individual or group level. Culture is the web that humans weave - the glue of societies.

Cultures are continuums of variation making them difficult to delineate in precise terms (Alleyne, 1988). Referring to African, European, Caribbean, etc. culture does not mean that all people included by the term share a standard set of cultural traits. Different individuals within in any culture possess commonly shared cultural features in different ways, to different degrees and in different conglomerations. Cultural analysis requires a tolerance for complexity which runs counter to the common drive for simplification.

### *1.2.3 Safety culture*

One of the most quoted definitions of safety culture is provided by the Advisory Committee on the Safety of Nuclear Installations (ACSNI) study group on human factors, who define it as: *the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and proficiency of, an organisation's health and safety management.* (HSC, 1993). Pidgeon (1991) expands the definition of safety culture to also include socio-technical practices concerned with risk minimisation. One of the most simple and general, but useful, definitions of safety culture is: *aspects of culture which affect safety* (Waring, 1992).

Safety culture is concerned with the attitudes, behaviours, systems and environmental factors that promote effective risk management. Risk management culture, is probably a better use of language rather than safety culture, as the term *risk* includes both health, safety and environmental

hazards, and the inclusion of *management* places the focus for action on all those with a degree of control over risk. When referring to safety culture in this study, it is in the holistic risk management sense relating specifically to occupational health and safety.

#### ***1.2.4 The construction industry***

The construction industry is the mixture of fragmented organisations specialising in particular or multiple activities relating to the built environment. These include property developers, architects, engineers, quantity surveyors, accountants, lawyers, management contractors, engineering contractors, civil engineering contractors, labour only subcontractors and specialist trades. The construction industry operates on international, national, regional and local scales, with participants ranging from large multinational organisations to one-man-bands. Construction projects vary from simple dwellings to complex structures such as nuclear power stations. Projects may involve just the client and the builder, others involve hundreds of suppliers, contractors and consultants. The prevalence of small firms, subcontracting and fragmentation are characteristic features of the construction industry.

### **1.3 Summary**

Neither safety nor culture are simple and straightforward concepts. It is not surprising, therefore, that there has been considerable debate about the precise definition of safety culture and the utility of the concept. Elitist paradigms see it as organisational best practice safety management so an organisation does not have a safety culture unless they can demonstrate excellent risk management performance. Relativists consider all organisations to possess a safety culture which can be placed on a scale from good to bad. The top-down functionalist perspective views safety culture as a structured and formal system for managing risk which is imposed by management. The bottom-up interpretative approach highlights the complexity and variability of safety culture emerging from social interaction in the workplace. This study attempts



to combine the key aspects of each perspective by examining best practice safety management, typologies of safety culture and key areas for improving risk management performance, including power relations in organisations.

This study examines prevalent attitudes and behaviours which impact upon the safety culture of the construction industry in Britain and the Caribbean. It considers aspects of safety culture at the site, company, industry and societal levels. It draws information from various disciplines to produce a holistic analysis of safety culture. Owing to the cross-disciplinary nature of this work, many issues will remain only partially explored from the specialists perspective. Time limitations prevent the full exploration or critique of many of the concepts and ideas presented in this thesis, but are presented as spotlights which help illuminate the multifaceted reality of a the concept of safety culture and risk management.

The following introductory chapters review much of the literature relevant to accident causation, safety culture, risk, Caribbean culture and the construction industry. They highlight the shift from strictly functional to more holistic and interpretative paradigms in safety related thinking, the characteristics of the construction industry in both regions and aspects of Caribbean culture which impact on safety culture. Subsequent chapters describe the methodology used, present and discuss the results obtained and bring the study to a conclusion.

## *Chapter Two: Accident Causation*

Accidents are unplanned loss events which result in physical harm to people or property (Ridley, 1990). Safety is about the prevention of accidents and loss events. In order to prevent occupational accidents, there must be an appreciation of their root causes. Accidents are commonly considered to be the product of: bad luck, destiny, the behaviour of the victims or those directly involved, failure of the management process, negligence, or the very complexity of modern socio-technical systems. Three different accident causation paradigms can be identified, the fatalistic, modern and postmodern (Green, 1997). These paradigms attribute accidents to either acts of god and destiny, the inevitable and unimportant by-products of modern living, or the failure of risk management activities, respectively. This chapter reviews the principal theories developed to describe the process of occupational accident causation which developed in the 20th century.

Models of the accident causation process range from simplistic domino models, to organisational pathogen and socio-technical system models. The change in focus of these models reflects a change from modern to postmodern paradigms and different approaches to safety management. The unsafe acts theory promotes the view that accidents are attributable primarily to worker behaviour. The unsafe conditions theory is based on the principle of engineering out hazards; while the organisational model views much of human error as a consequence of organisational arrangements. Occupational injuries are the product of complex and chaotic socio-technical systems. A thorough understanding of what the safety profession has classified as *human factors* is key to understanding the process of accident causation.



## 2.1 Unsafe Acts, Unsafe Conditions Theory

In a study of 12,000 accident insurance claims in the 1930s, unsafe acts by workers were identified as the primary cause of 88% of accidents (Heinrich, 1959). Heinrich developed a domino theory of accident causation based on the assumption that accident causation can be seen as a single sequence of events resulting in an accident. His first domino is concerned with the accident victim's personal traits; the second with their actions; the third with unsafe acts and conditions; the fourth with the accident; the fifth with the injury. The prevention of unsafe acts *and* conditions is highlighted as the key to reducing occupational accidents.

Heinrich (1959) postulates that the prosperity of the world is at risk by a lack of proactive accident prevention due to the costs involved in accidents. He asserts that 98% of accidents are preventable by dealing with the immediate causes of accidents, ie unsafe acts or unsafe conditions, and proposes four basic methods to prevent accidents: engineering revision; persuasion and appeal; personnel adjustment; and discipline. Three of Heinrich's four methods of accident prevention focus on personnel management issues betraying his bias towards the unsafe acts theory of accident causation.

Many accident causation debates are blame orientated, focusing on deciding whether the cause was an unsafe act or unsafe condition. Most employers favour the *unsafe acts* option as it limits their liability, responsibility, and keeps the amount of remedial work required to a minimum. The fact that an accident occurs means that the business process has malfunctioned, resulting in a loss event, therefore investigations tend to concentrate on pinning the blame on somebody, usually the injured person. Trade unions and government regulators tend to favour the unsafe conditions, engineering based argument for the causation of a majority of industrial accidents. Investigations by these bodies tend to focus on *unsafe conditions* and failure to meet applicable standards. Traditional approaches to safety management based upon often

superficial accident investigations, offer only a narrow, simplistic and biased approach to understanding a complex social process (HSC, 1993).

*Safety management founded on accident investigation reduced the complexity of the problem to the point where it became comprehensible ... key features of the traditional approach were the search for a primary cause and the debate as to whether the primary cause was an unsafe act or unsafe condition. HSC (1993) p13*

A bias towards the unsafe acts theory of accident causation has deep cultural roots and a major impact on perception. Factory owners, managers and workers often feel that the engineering safety measures advocated by safety professionals, are over the top, unrealistic and inappropriate to their customary productive practices. Safety for many managers and workers is an imposition from government people who don't really know the job. Safety precautions are a waste of time and money, when the cause of accidents is attributed to careless worker behaviour, or they are seen as an inevitable part of the productive process. Bird and Loftus (1976) list the following management quotations:

- ♦ "I don't have money for frills like safety";
- ♦ "all accidents are caused by plain carelessness";
- ♦ "were not in business for safety";
- ♦ "there's no place for sissies in dangerous work";
- ♦ "these stubs on my hand are just part of doing business".

The *unsafe acts unsafe conditions* paradigm dominated early safety thinking for over 50 years (Cooper, 1998). It provides a simple, and in individualistic societies a culturally appealing, approach to accident causation that promotes the concept of accident proneness. Accident prevention theory based on the accident prone paradigm limits itself to ensuring that such people are not exposed to hazardous situations (HSC, 1993). The theory of accident proneness derives its scientific appeal from the use of accident frequency curves which show an unequal liability distribution. The susceptibility of individuals with specific characteristics appears to play a fundamental part in accident causation. The accident proneness concept was developed as a stable personality trait in the 1920s.



Subsequent work cast doubt on the methodologies employed in studies of accident proneness, which failed to take into consideration hazard exposure and management factors. Lawton and Parker (1996) identify two key personality traits involved in accident liability, extroversion and introversion. Extroverts are impulsive, aggressive and sensation seeking, and have an increased propensity to commit violations. Introverts are neurotic, easily distracted and have an increased propensity to commit errors. Personality traits are moderated by life events, work pressures, experience, training, management style, etc. Life circumstances can combine to affect an individual's personality at any time in life. Accident proneness is a combination of factors and circumstances, rather than an enduring personality trait (Glendon and McKenna, 1995).

### 2.1.1 *Blame*

The prevalence of accident proneness theory for explaining the causation of accidents is linked with the unsafe acts approach and need to apportion blame. Accident victims often assume blame, while managers are commonly quick to apportion blame (Larson, 1983). Managers show a clear reluctance to place any blame on themselves for accidents (Livingstone, 1997). There is a bias towards blaming operators rather than examining failures within management systems (Smith, 1998). The habit of management to blame operators is a form of projection and denial. This projection is a self-protective mechanism that can be considered to be a function of their dominant position in the organisation (Smith, 1998). Managerial core believes and values lie at the heart of organisational risk management abilities.

Reason (1997) considers that the propensity to blame accident victims is a deep rooted human psychological characteristic known as *fundamental attribution error*. Poor performance or error is related to individuals being careless, stupid, reckless or incompetent, rather than an aspect of human nature that needs to be managed. Fundamental attribution error is a product of the *illusion of free will*, ie, the cultural value of being captain of your own fate which is prevalent in

Western societies (Reason, 1997). The illusion of free will combines with situational factors that make individual actions easier to change than organisational and engineering factors. People are warned and disciplined when they behave unsafely, without consideration of the situational antecedents that motivate the unsafe behaviour. When unsafe acts are repeated, the individual is seen as deliberately flouting management instructions, resulting in further sanctions being imposed in a blame cycle. The British construction industry management style is characterised by hire and fire attitudes prevalent in blame orientated cultures.

Guest, *et al.* (1994) describe a blame culture in British Rail in which safety is not an issue that was discussed openly because management blamed workers for errors and accidents. High accident experience gangs claimed to be highly safety conscious, but considered that accidents were not their own fault, externalising the blame by being critical of everyone else. There is a long standing habit in Western societies of trying to pin the blame on individuals following accidents. A high degree of personal culpability; safety seen as conflicting with other priorities; quantification seen as promoting understanding; complex system failures not open to prediction; anticipation may make things worse; and narrow participation in decision making are characteristic doctrines of blame cultures (Pidgeon, 1992).

The simplistic *unsafe act unsafe conditions* theory stems from a lack of a clear understanding of the relationship between safety and risk. The common definition of safety as *freedom from danger* encourages the view that safety is achieved until things go wrong. Most people consider that if employees are not injured at work, then safety has been achieved. This is akin to saying that someone who has dangerous high levels of fat and cholesterol is healthy because they have not yet had a heart-attack. Being safe involves more than merely avoiding accidents. Accident statistics measure the lack of safety; valid measures should reflect what safety is, not what it is not. Goals for improving



occupational safety must also go beyond simply reducing injuries (Bradford and Ryan, 1996).

Individual behaviour is an important factor in accident causation. However, everybody makes mistakes and the focus of attention should not be solely on those immediately connected with an accident. Individual behaviour in the face of danger is but one aspect of the complex socio-technical system of accident causation. Heinrich's domino theory of accident causation concentrates on the role of injured person, but also emphasises the importance of supervisors, as key in accident prevention because of their front line role in employee control. It also includes management and cultural issues, such as ancestry and social environment, in accident causation. Heinrich (1959) considers that management are in the best position to prevent accidents and should therefore assume that responsibility. He stressed the importance of positive attitudes to safety in all people, particularly supervisors and executives. To prevent accidents he advocated the implementation of safety management systems which include the investigation of the root causes of accidents and analysis of facts in a logical sequence; and the selection and application of appropriate remedial measures.

Because of the lack of a holistic analysis, the *unsafe act unsafe condition* philosophy fails to identify the complexity of accident aetiology in the industrial environment. Accidents can stem from a myriad of inter-reacting variables throughout the production process. Perrow (1984) considers that complex industrial systems are imperfect and inevitably generate *normal accidents*. The search for simple, single cause explanations for the causation of accidents, which following Reason (1990), are multi-causal in origin, is a narrow analysis that is symptomatic of a technocentric, individualistic, hierarchist blame culture. As exemplified by the investigation of the Kegworth plane crash in 1989, the individuals immediately connected with a loss incident are under scrutiny rather than the engineers, designers, managers and directors who direct the industrial productive process (Glendon and McKenna, 1995).

*Rather than being the main instigators of an accident, operators tend to be the inheritors of system defects created by poor design, incorrect installation, faulty maintenance and bad management decisions. Their part is usually that of adding the final garnish to the lethal brew using ingredients that have already been long in the cooking. Reason (1990) p173.*

## 2.2 Loss Control

In the 1970s the dominant accident causation paradigms moved away from the immediate scene of an accident, to consider wider issues relating to risk management. The Flixborough explosion marked the beginning of a cultural revolution in the safety management in the chemical and process industries in Britain (Marshall, 1994). Prior to this disaster, the safety culture was characterised by a tactical, shop-floor focused approach to safety management. Safety management was restricted to the enforcement of no smoking rules and demonstration of the correct use of protective equipment by junior management. Subsequently, the focus shifted to boardroom and organisational strategies for controlling risk. A similar disaster in Beek in the Netherlands in 1975 and the Seveso disaster in 1976 in Italy combined to galvanise the EU into action resulting in the Seveso directive aimed at controlling major accidents in the chemical and process industries.

Bird and Loftus (1976) put forward the *Loss Control Model* of accident causation. In this domino model management control is the first domino in the accident sequence. The authors identify five dominoes that lead to a loss incident:

- ♦ **domino 1**    *management loss of control*: failure to fully control the activities of organisations produces circumstances which produce loss incidents
- ♦ **domino 2**    *origins*: root causes exist due to poor management
- ♦ **domino 3**    *symptoms*: substandard practices and conditions then occur
- ♦ **domino 4**    *contact*: incident may result in
- ♦ **domino 5**    *loss event*.

The *Loss Control* model widens the traditional reactive approach to accident prevention, promoting the proactive prevention of loss by the use of



well-documented management systems the fundamental importance of management in the control of the many precursors or antecedents of any loss incident (Bird and Loftus, 1976). From their study of 1.5 million accidents and incidents over 3 billion man hours, in 300 companies from 21 industrial groups, they found ratios of serious accidents to minor accidents of 1:10, minor accidents to property damage events of 10:30 and property damage to near miss incidents of 30:600.

*The 1-10-30-600 relationships ... seem to indicate clearly how foolish it is to direct our total effort at the relatively few events terminating in serious or disabling injury when there are 630 property damage or near miss incidents occurring which provide a much larger basis for more effective control of accident losses. Bird and Loftus (1976) p34*  
Diagram 3.

The *Loss Control* domino model highlights the initiating role of management failures in loss prevention. Their model regards the loss of managerial control as the root cause of all the multiplicity of factors that lead up to a loss incident. The prevention of the fall of the first domino is the key to loss prevention. The role of the manager is therefore crucial in their analysis. They quote Drucker, one of the most respected management writers, regarding the almost universal ignorance of the function of management, which he regarded as one of the most serious weaknesses of industrial society.

*The need to know what a manager is, what work he does, and how he does it in a professional way, is not only a basic need of most safety and loss control people it is at the base of most of their problems. Bird and Loftus (1976) p 51*

Bird and Loftus (*ibid*) advocate both humanistic and quantified techniques for effective loss control management, including the use of formally documented audit techniques, and following the principles of management and behavioural science. They favour Drucker's "*what gets measured gets done*" philosophy, utilising formal documentation and procedures to obtain management control of an organisation's activities. They identify, (amongst others), the following principles of risk management:

- ♦ *what gets measured gets done;*
- ♦ *managers achieve results through others - each manager should therefore plan, organise, lead and control with co-operation in mind;*

- ♦ *target points of control* - the key person is the highest level of operating management, because supervisors tend to adopt upper management's attitudes;
- ♦ *definition* - must identify the real problem before an effective decision can be made;
- ♦ *reciprocal interest* - people are motivated to accomplish what you want by being interested in what they want to achieve;
- ♦ *feedback* - motivation comes from recognition, ie, by giving positive feedback;
- ♦ *multiple causation of events* - identify every potential cause of loss and give the greatest attention to the most serious risks;
- ♦ *the Pareto principle* - the critical few and trivial many - only one problem in four is worth close attention therefore delegate effectively; and
- ♦ *resistance to change* - the greater the departure of any planned change from the accepted ways of the past, the greater the potential resistance on the part of the people involved.

Du Pont have been one of the most successful organisations in employing loss control strategies. The Du Pont philosophy considers that safety is good for business; all accidents and injuries are preventable and that working safely is a condition of employment. Du Pont found that 90% of accidents are due to unsafe work practices and therefore focus on ensuring that employees are motivated to participate in safety management (Clark, 1992). Du Pont's safety management programme resulted in improved communication, co-operation and mutual respect.

The concepts of loss control management led to the development of the International Safety Rating Scheme (ISRS) and other safety auditing systems. Applications of their philosophy and techniques can produce spectacular improvements in safety. Examples of the success of the safety management approach, include logging operations in Columbia that achieved a 75%



decrease in accident frequency and a 62% decrease in compensation costs (Painter and Smith, 1986). Lauriski and Guymon (1989) found that the introduction of a safety management programme reduced lost time injury rates by approximately 60% at the Utah Power and Light Company. The accident frequency rate fell from 40 to eight between 1980 and 1988, while production more than doubled. Alpart, a bauxite producer in Jamaica, achieved a greater than 50% reduction in the number of reportable accidents between 1990 and 1992 (Hendricks 1993, personal communication).

The Loss Control approach to safety management has worked in many organisations, such as Dupont, but has also been known to fail. Neumann (1989), in an examination of the failure of safety management programmes, found that problems occur when people don't participate due to management styles that discourage participation, ie, where rank and status are more important than competence and there is a look after number one philosophy. In a study of 42 matched pairs of US plants from six different industries, high accident plants were characterised by low management commitment to safety, authoritarian management styles poor communications, little training and poor housekeeping (Smith, *et al.* 1978). Commitment, motivation, communication, trust, competency, leadership error, behaviour and perception are key human factors in the aetiology of accidents.

### **2.3 Human Factors**

Psychologists, anthropologists, biologists and sociologists have widened the scope of analysis applied to the discipline of safety expanding the knowledge base concerning human factors. The growing importance of the social sciences and human factors in the discipline of safety is demonstrated by the differences in content of the Royal Society reports on risk in 1983 and 1992. The ACSNI study group concluded from their review major incident investigation reports that social factors must be incorporated in safety programmes (HSC, 1993). HSE define human factors holistically, including the environmental, organisational, job, human and individual factors that may influence health

and safety (HSE, 1999). Researchers have examined the nature of human error (eg, Rasmussen, 1987; Reason 1990) perception of risk (eg, Slovic, *et al.* 1987) and more specifically risk taking behaviour in the construction industry (eg, Andriessen, 1978; Leather, 1987; Hinze, 1996).

Investigations into the causation of major incidents have revealed that the accident causation process is complex and multifaceted (see for example Perrow, 1984; Pidgeon, 1992; Reason, 1990; and Turner, 1992). The complexity of organisations and technologies in modern industrial societies is considered by some authors to make the occurrence of accidents normal events (Perrow, 1984). Risks from the use of technology now cross national boundaries and are a global concern (Beck, 1992). There is an increasing trend towards risk aversion in many industrially developed societies due to the increasing sense of individualism and increasing public distrust of experts, industrialists and politicians (Furedi, 1997). Human factors of this kind are key aspects of safety culture.

### 2.3.1 Human Error

*... each step in a planned sequence of actions or thoughts provides an opportunity to stray along a multitude of unintended or inappropriate pathways. .... human error is neither as abundant nor as varied as the vast potential might suggest. Not only are errors much rarer than correct actions, they also tend to take a surprisingly limited number of forms, surprising that is, when set against their possible variety. Moreover, errors appear in very similar guises across the wide range of mental activities. Reason (1990) p2.*

The nature and causes of individual and organisational error has been subject to much investigation by social scientists. At the individual level Rasmussen (1987) proposes the *skill-rule-knowledge-based* framework for classifying error. At the skill-based level, human performance is governed by stored patterns of pre-programmed instructions. Errors result from the misapplication of the skill to variable circumstances due to deficiencies in the recall process (eg, lapses caused by forgetfulness and inattention; slips caused by distraction, misordering or mistiming). Rule-based errors are typically mistakes caused by the application of the wrong rule or due to the correct application of a dysfunctional rule. Errors at the knowledge-based level occur in novel



situations when plans and actions are made on-line, using conscious analytical processes and stored knowledge. Mistakes arise from resource limitations and incomplete or incorrect knowledge.

In a study of safety culture in nuclear installations half of all errors were found to be skill-based, committed during routine and familiar operations (Pedersen, 1995). Most investigations of error, however, focus on correcting rule and knowledge-based errors leading to more programmes, supervision and training, none of which applies to reducing mental lapse error. Removing stresses in the work environment, by providing user friendly technology and systems of work, reduces the likelihood of lapses (HSE, 1999). Figure 2.1 shows the relationships between the different types of human failures. Mistakes are widespread and appear to be the product of inherent features of the automatic retrieval process, ie, *similarity matching* (rule-based error) and *frequency gambling* (knowledge-based error), which provides schemata to the consciousness.

**Figure 2.1 Human Errors** (HSE, 1999).



Slips and lapses are errors that result from failures in the execution of an action, regardless of whether or not the plan was adequate to achieve its objective. Slips occur during the performance of a largely automatic tasks, where there is a marked degree of distraction from the work task (Reason, 1990). Lapses occur when people forget to carry out an action (HSE, 1999). Mistakes are

intended actions which proceed as planned but fail to achieve their intended outcome. Mistakes are deficiencies or failures in the planning processes which occur when people do the wrong thing, believing it the right thing. Mistakes are subtle, complex and less well understood than slips.

Violations are any deliberate non-compliance with formal rules, procedures and regulations, including workplace norms, sabotage and vandalism (HSE, 1999). Workers who operate dangerous machines without wearing protective equipment or using appropriate guards, are committing violations. Violations are routinely committed to save time and effort, or where the rules are not enforced or they are perceived not to apply. Situational violations occur where job factors, eg, time pressures, defective equipment and impractical procedures, promote rule breaking. Exceptional violations can occur when things go wrong and risks are taken in the belief that outweigh the risks. Violations can be combated by involving workers in formulating work rules and procedures for all foreseeable eventualities, ensuring they are practical and relevant, providing relevant training and by conducting regular monitoring and giving timely feedback. Ongoing research suggests that violations are the most serious types of error and key predictor of accidents (Rundmo, 1999).

Because of the nature of human error, Reason (1990) advocates the promotion of mental self checking to prevent the slips and lapses caused by adopting behaviour from habit instead of giving rigorous thought to specific tasks. In spite of the vast capacity for errors in human behaviour, often with catastrophic potential in advanced technological societies, there are ways of understanding and creating resilience to human error (Reason, 1990).



### 2.3.2 Behavioural Theory

Behaviour is a function of *contingencies*, ie, the relation between responses and stimuli (Skinner, 1978). The link between behaviour and soon-certain-positive consequences is the engine of human performance (Krause and Hidley, 1992). Behaviouralists consider that unsafe behaviour is prompted by naturally occurring antecedents and consequences that trigger and reinforce unsafe behaviour. Within an organisation, triggers and rewards for unsafe behaviour represent barriers to safe work. Sulzer-Azaroff (1987) asserts that past and present contingencies play a role in unsafe behaviours, and gives the example of a worker who violates the rule that eye protection must be worn when sharpening a tool. This unsafe behaviour is prompted by an emphasis on production in the workplace resulting in peer ridicule for safe behaviour, because the protective behaviour takes longer and the negative consequences of an accident occurring are unlikely in the workers' experience. The negative social consequences of safe behaviour are soon, certain and negative, while accidents are comparatively rare events.

The behavioural approach to improving safety differs from traditional approaches by concentrating on observable safety behaviour, rather than unobservable attitudes and by encouraging safe behaviour, rather than punishing unsafe behaviour (Cooper, 1994). Behaviouralists consider there to be only a weak correspondence between attitudes and behaviour, because attitudes are an expression of preferred rather than actual behaviour. Managers often state that safety is important, but then design work and reward systems that are hazardous and encourage unsafe behaviour (Cooper, 1994).

#### *Attitudes*

The motivation of human behaviour has been subject to analysis by competing concepts of goals, drives, needs, values, attitudes, motives and instincts by psychologists. Early theories of motivation focused on instinct and inborn drives and the satisfaction of inherent needs (Glendon and McKenna, 1995). Maslow (1970) places culture and learning above instinct and survival in his

hierarchy of human needs. McClelland (1961) identifies the need for achievement (NACH), expectancy of success and reward as motivators of behaviour. NACH is characterised by control, competition, materialism and positive work ethic. Both McClelland's and Maslow's work has been criticised for being inherently Eurocentric.

Locke and Latham (1990) consider that a behavioural goal is something an individual wants to achieve. This want involves a positive attitude towards an end state. Motivation theory must therefore deal with the concept of attitudes. Attitudes involve the evaluation, differentiation and verification of many interrelated variables (Glendon and McKenna, 1995). Attitudes are associated with personality and deep seated values. Attitudes are created and organised through experience and exert a directive or dynamic influence of an individual's response to all objects and situations to which they relate. Attitudes are learned through classical operant conditioning, in the same way that other responses are learned.

No commonly accepted definition of the concept of attitudes exists, because the word attitude has more than one meaning in the English language (Jaspers, 1978). Attitude can mean aptitude, a fitness or tendency for action, or the posture of a figure or mental state. In psychology there are numerous concepts which all refer to the idea of an acquired behavioural disposition, including: belief; cognitive structure; conditioned reflex; conviction; determining tendency; expectancy; habit; intuition; motive; habit; opinion and value. Attitudes consist of three related elements, namely: cognitive (perception), affective (feelings) and conative (behaviour) (Jaspers, 1978). Rokeach defines an attitude as "a learned orientation, or disposition, toward an object or situation which provides the tendency to respond favourably or unfavourably to the object or situation" (quoted in Morgan and King 1971).

Glendon and McKenna (1995) identify four models relating to the link between attitudes and behaviours. Two of these are simplistic linear models implying a direct causal link between attitudes and behaviours, with one resulting in the



other, ie, attitudes determine behaviour, or vice versa. The behaviouralist interpretation of the concept of attitude turns upside down the whole notion of attitude as an important determinant of behaviour; believing that it is not the attitude which determines behaviour, but behaviour which determines attitude (Jaspers, 1978). The third model considers there to be a mutually influencing link between attitudes and behaviours (Figure 2.2).

**Figure 2.2 Simple Attitude Behaviour Link Models**  
(Glendon and McKenna, 1995)



The relationship between behaviour and attitudes is more complex than represented by these simplistic models. Attitudes are related to behaviours only when there is strong correspondence between the target and action elements of both attitudinal and behavioural entities (Ajzen and Fishbein, 1977). The often observed failure of attitudes to produce corresponding behaviours is due to the poor correspondence between the target, action, time and contextual elements. In organisations that focus solely on the bottom line, strong antecedents are established, which directly influence the behaviour of managers to a greater extent than do individual attitudes.

Behaviourists, following Skinner, consider that external social conditioning prompts human behaviour, while humanists, such as Maslow (1970), see it as motivated by a hierarchy of biological and psychological human needs.

Biological imperatives include physical factors such as nutrition, respiration and reproduction, while socio-psychological factors include the needs for security, loving and esteem. Maslow (1970) also emphasises the importance of schemata and culture in his analysis of human behaviour. Schemata are unconscious mental structures composed of old knowledge that the long term memory constructs as active knowledge structures (Reason, 1990). Schemata reconstruct rather than reproduce experience leading to predictable biases in remembering. People are motivated more by positives than by negatives, while similarity matching and frequency gambling often govern reasoning more than logic.

### *2.3.3 Self-Protective Behaviour*

Three types of models of self-protective behaviour can be identified, namely value-expectancy, contextual and behaviour change models (Dejoy, 1996). Value-expectancy models are grounded in the concept that people do a quick cost benefit analysis and risk assessment when choosing actions. Emphasis is placed upon risk perception, self-efficacy, response efficacy, barriers (eg, discomfort, cost) and normative expectations (eg, social norms, feedback). Contextual models focus on the interaction between personal and environmental factors (Dejoy, *ibid*).

An example of a contextual model is Hale and Glendon's (1987) *Behaviour in the Face of Danger* model which is concerned with the way in which people seek and control hazards following the work of Rasmussen and Reason. People at risk in the work environment need knowledge, skills, procedures and the motivation to identify and prioritise hazards, and take appropriate preventative measures. Furnham (1994) proposes a similar model focused on accident occurrence identifying perception, cognition and action as key stages necessary for ensuring safe behaviour. He introduces the element of chance into his model of accident occurrence (Figure 2.3). The process of behaviour initiation is represented as a number of stages at which different factors have different degrees of influence, for example, risk perception is an important



initiator behaviour, but is less important once behaviour change is underway (Dejoy, 1996).

Figure 2.3 Sequential Accident Model (Furnham, 1994)



In contextual models, self-protective behaviour results from individual attitudes and characteristics, combined with enabling factors including skills, knowledge and equipment, and reinforcing factors such as rewards and social approval. The interaction of these three factors is key in understanding worker behaviour. In Bandura's theory of *Social Learning* (Figure 2.4), human behaviour is extensively motivated and regulated by cognition and external sources of influence (Bandura, 1986). The situation that people find themselves in influences both their behaviour and their attitudes, where people's behaviour influences both their attitudes and their situation, and people's attitudes influence their behaviour and situation.

Figure 2.4 Bandura's Theory of Social Learning (1977)  
(aka Social Cognitive Theory 1986, 1991)



This model explains psycho-social functioning in terms of triadic reciprocal causation (Wood and Bandura, 1989). Behaviour, personal factors (including cognition and self-efficacy), and environmental factors interact and influence each other. The influence they exert is not equal or simultaneous, but varied and complex. In organisations, the theory (also termed *Social Cognitive theory*) provides a framework for clarifying the psychological mechanisms that link socio-structural factors with organisational performance. The beliefs and attitudes prevalent within an organisation are drawn initially from its external environment. The beliefs of those in positions of power, supervisors, managers and senior executives, influence the internal environment of the organisation through strategy, the design and implementation of structures and systems within the organisation, and day to day supervision of work groups (Williams, Dobson and Walters, 1989).

Social cognitive theory provides a useful framework for understanding accident causation and conducting cultural studies (Cooper and Philips, 1995). The theory identifies the mechanisms by which organisational culture affects



employee behaviour, and vice versa. The framework can be applied to each individual element involved, eg. to study safety climate, behaviours, and management systems. Factors such as job pressures risk perception, personal efficacy and commitment can be explored. Bandura's (1986) triadic model of social functioning is discussed further in relation to safety culture following the work of Cooper and Phillips (1995) and is used as a framework for this study (see Chapter 7 - Methodology).

#### **2.3.4 Organisational Error**

Investigations in the 1980s into major disasters such as Piper Alpha, Kings Cross Fire, Herald of Free Enterprise, examined the root causes of these incidents. The finger of blame moved from those front line individuals or technical failures traditionally identified, to management systems, processes and the role of directors and managers. These investigations revealed a disturbing failure of directors and managers to manage safety effectively. Reason (1990) uses the metaphor *resident pathogens* to describe the latent failures caused by management decisions or actions that lie dormant within an organisation and often go undetected until a trigger event results in an accident. He describes how seemingly minor errors combine through the organisational process to produce disasters:

*The important lessons of case studies are that disasters are very rarely the product of a single monumental blunder. Usually they involve the concatenation of several, often quite minor, errors committed either by one person or, more often, by a number of people. In general, the errors contributing to human-made disasters recognisably belong to the familiar body of slips, lapses and mistakes to which all of us are prone in the normal course of daily life. Any one of them might have had negligible consequences; but their effects accumulate, each compounding the mischief of its predecessors, so that in retrospect the whole series seems to move inexorably towards its calamitous conclusion.* Reason (1990) p17

Within organisations people make errors both at the work-face and during the planning of work. Following social cognitive theory, error producing behaviours are influenced by the work situation and personal factors. Errors made by work designers in the planning process can result in hazards in the work environment. Failure to react to a hazard in a way which will reduce the risk of injury is influenced by behavioural norms, familiarity, knowledge,

perception, pressures, resources, etc. Reason's (1990) Swiss cheese model of organisational accident causation highlights the complexities of organisational error.

Reason (1990) uses the analogy of layers of Swiss cheese to describe the interaction of organisational systems and behaviour in the accident causation process (Figure 2.5). The systems and procedures which organisations construct as defences to avoid loss events are represented as layers of cheese. The holes in the individual layers of Swiss cheese represent the errors and mistakes residing as latent pathogens within the organisational system. When there is alignment between the holes within the organisations defences, an active failure can result in a loss event. There is therefore a need to proactively identify and remove latent failures, rather than merely reacting to active failures. Reason (1990) identifies the following relationships between organisational systems and latent failures:

- ♦ the more latent failures in the system, the greater the likelihood of an accident;
- ♦ the more complex the system, the greater will be the number of latent failures; and
- ♦ the higher the individual within an organisation, the greater is his or her opportunity for making latent failures.

The pathogen model recognises that personal, situational and behavioural factors are the precursors of unsafe acts; that their strength may vary; and that it takes time for one element to exert its effects on the other two (Cooper, 1998). The accident sequence starts with problems in organisational decision making, ie, planning, designing, specifying, communicating, regulating, maintaining, etc. Two pathways are present for these organisational factors to produce accidents: the active failure route runs through workplace conditions to workers, eg, a worker fails to use a guard whilst operating a dangerous machine resulting in an accident; and latent failure route which runs directly



from the organisational process to the defences, eg, a decision not to invest in new machine guards may result in an accident occurring many months later.

**Figure 2.5 Swiss Cheese Model of Organisational Accident Causation**  
(Reason, 1995)



Reason (1995) distinguishes between two types of managerial failings: types and tokens. Types refer to general organisational and managerial failings either at a strategic level (source types) and those types associated with line management implementation of source type pathogens. Tokens comprise situational failings associated with systems of work and technology, and psychological pathogens associated with lack of attention, motivation, etc. (Cooper, 1998). Reason (1995) considers that the accident causation process is influenced by the economic and political context in which organisations operate, but limits his model to those factors over which management can exert

some control. He identifies five key elements of productive systems: high level decision making; line management control of operational activities; resources, ie, technology and manpower; synchronisation of people, materials and technology; and defences to minimise risk.

The key principle for effective error management is that we cannot change the human condition and remove errors caused by distraction or forgetfulness and deliberate violations, only the parameters within which people work (Reason, 1997). Errors are largely unintentional and arise from problems concerning information, blaming people for errors has little positive effect. The best people can make the worst errors. Violations are a reflection of motivational problems, which can seriously undermine organisational performance. Reason (1997) identifies several organisational error management tools that address workplace, organisational and task related factors including: Human Error Assessment and Reduction Technique (HEART); Influence Diagram Methodology (IDM); Maintenance Error Decision Aid (MEDA); and Tripod-Beta.

HEART is a tool for assessing the impact of violation-producing conditions (VPCs) to predict the likelihood of failure to comply with safe operating procedures. Using a set of generic task types, such as complex, routine, unusual, etc. and error-producing conditions (EPCs), multiplied by the probability of error, the impact of VPCs can be assessed. EPCs include unfamiliarity, shortage of time, lack of information, lack of means to reverse unintended actions, stress, low morale, etc. The most important VPCs identified include: perceived low likelihood of detection (x 10); inconvenience (x 7); authority to violate (x 3); copying behaviour (x 2.1); approval by those in authority (x 2); and group pressure (x 1.07). A weighting of 1.4 is applied to take account of the increased likelihood of males adopting non-compliant behaviour. Reason (1997) considers that the lists of EPCs and VPCs provide the best available description of the factors that promote work errors and violations.



Dejoy (1990) distinguishes between three categories of causal human factors (predisposing; enabling; and reinforcing), and identifies the interface with technology, decision-making and the environment as three specific areas of error occurrence. Predisposing factors include personal characteristics, including risk perception; enabling factors are characteristics of the environment or system which influence risk taking behaviour; and reinforcement factors that reward or punish behaviour, eg, feedback from managers and peer group. Dejoy (ibid) also identifies three categories of control strategy, namely: system modification; managerial action; and worker behaviour that can be combined to prevent accidents in organisations. Management involvement and support, open communications and constant attention to safety are associated with good safety performance.

#### *2.3.5 Socio-technical systems*

Typically 70-80% of the preconditions of major industrial accidents are human or organisational in origin (Pidgeon, 1993). Individuals, groups, organisations and cultures, are all involved in the design, construction, operation, use and decommissioning of technological systems. Many of the preconditions to disasters originate in the social and organisational arrangements of socio-technical systems. HSE's Accident Prevention Advisory Unit (1976) concludes that:

- ♦ management need to take proactive measures to minimise risks;
- ♦ social factors are frequently a significant cause of accidents;
- ♦ health and safety is part of the broader picture of human relations.

The concept of socio-technical system stresses the close interdependence between technology and individuals, groups, organisations and societies. Technica (1989) define a socio-technical systems approach to accident causation expanding traditional domino and resident pathogen theories of accident causation (Figure 2.6). The system is a pyramid divided into five tiers with engineering reliability at the apex, followed by operator reliability,

communication, organisation and management, and system climate at the base. Problems can manifest themselves at any level in the pyramid and may result in an accident. System climate includes external influences on management and the organisation including public attitudes, regulations and technology (Technica, 1989). Use of term 'system climate' in this context is closer to the concept of culture used in this study, as opposed to the concept of safety climate (attitudes).

Figure 2.6 Socio-technical Model of Accident Causation (Technica, 1985)



This study considers the concepts of accident causation from a socio-technical system approach expanding the organisational safety culture paradigm to include societal influences. Managers are affected by outside factors over which they have little control including industry norms and standards, legislation and regulation, public opinion and pressures, political climate, resource availability, interface with other systems, economic climates, nature of hazards and location (Bellamy and Geyer, 1992). The US nuclear industry considers the impact of economic and regulatory factors as key predictive



indicators of safety performance (HSC, 1993). Economic pressures lead to the erosion of safety standards with safety precautions not maintained or ignored until the time comes when a lapse, mistake, slip or violation results in an accident. Safety standards are a product of history, resulting from public political and commercial pressures (H.M. Treasury, 1996).

After many large-scale accidents, more than 60% of recommendations made by public inquiries refer to social administrative matters, including the needs to communicate better, clarify responsibilities, improve supervision and monitoring (Turner, 1992). A complete analysis of safety must pay attention to social roles, hierarchies, power structures and information flows. Culturally shared values about appropriate safety behaviour, together with the rewards and sanctions that sustain these beliefs are also important. These issues are traditionally remote from the safety profession due to its engineering bias. The causal factors involved in the Flixborough, Piper Alpha, Bhopal, Chernobyl, Kings Cross and Challenger accidents, demonstrate the validity of Technica's holistic socio-technical model of accident causation.

### *Summary*

Many different theories have developed to conceptualise the accident causation process. This chapter traces their development from simple domino models which focus on the immediate accident event, to the holistic socio-technical systems approach. The more complex socio-technical system models are combined with the Bandura's social cognitive theory to provide a holistic framework for analysing safety culture in the construction industry. The following chapter examines the literature on safety culture.

## *Chapter Three: Safety Culture*

The concept of safety culture has increasingly become part of predominant safety paradigms. The term has been quoted with increasing frequency in discussions about high risk industries and the aetiology of accidents. The application of the concept of safety culture is generally restricted to organisations, having evolved from management studies. Reason (1997) considers that few things are so important, yet so poorly understood as the concept of safety culture. Cooper (1998) argues that an organisation's safety culture impacts on work methods, absenteeism, product quality, productivity, commitment, loyalty and satisfaction.

There has been some confusion concerning the use of the terms climate and culture in organisational research. Historically the concept of organisational climate preceded that of organisational culture (Schein, 1990). The term organisational culture, first coined in the 1960s, was synonymous with the use of psychological climate (Hofstede, 1994). There has been similar confusion in the safety research discipline as in management research, over the use of the terms climate and culture. Literature searches using either safety climate or safety culture produce overlapping lists of articles (Phillips, *et al.* 1994). In this study the term safety climate relates to collective cognitive aspects of safety culture, ie the way in which people perceive safety related issues, which are complex, changeable and outside individual control. The term safety culture relates to the holistic study of organisational risk management including the examination of safety related behaviour, safety climate, management systems and environmental influences.

Waring and Glendon (1998) distinguish between two safety culture paradigms: functionalist - where organisational culture is viewed as manipulated and controlled by management; and interpretative - where culture is viewed as the



unique and complex, emergent property of organisations. The functionalist or top-down approach is based on the perception that organisational culture is dictated by management ideology, structure and practices in a simple cause-effect relationship. The interpretative or bottom-up approach perceives culture as the product of the interaction of all an organisation's members, and is not owned and controlled by any particular group. The interpretative view recognises organisational cultures as complex phenomena, with different subcultures being present within an organisation (Schein, 1990). Both functionalist/top-down and interpretive/bottom-up processes are important influences on safety culture (IAEA, 1998). The precursors of effective occupational health and safety risk management are both functional, involving management systems, and interpretative, highlighting issues such as trust, blame, risk perception, learning, commitment and motivation.

The management of health and safety within any organisation is primarily dependant upon the occupational risk related attitudes and behaviours of directors, managers and workers, who are part of both the organisation and wider society. Safety culture is influenced by all the factors that affect people's attitudes and behaviour in relation to safety, including race, religion, nation, community, group, history, technology and economics (Glendon and McKenna, 1995). Safety culture is that part of the wider cultural process which impacts on the way that risks to health and safety are perceived and controlled within groups, departments, organisations, industries, and societies. The preferred definition of safety culture followed in this study is:

*safety culture is the product of the reciprocal interaction of cognitive, behavioural and environmental factors in a social group which influence the control of risks to health and safety.*

*Bandura's Social Learning/Cognitive Theory*

Cooper (1993), Geller (1994) and Cameron (1997) advocate the use of Bandura's (1977) *Social Learning* theory for the analysis of safety culture. Cooper (1993), develops Bandura's model into a reciprocal model of safety culture. Cooper considers safety management systems as environmental factors in his model of organisational safety culture (Cooper, 1998). This is due to a focus on the organisation as a contained entity, where the efficacy of safety management systems is the key internal environmental determining factor. Bandura's model can also be applied at the industry level where the focus of behavioural factors examines safety management systems and the focus of environmental influences looks to external factors. Safety culture is the dynamic reciprocal relationship between group member's perceptions and attitudes towards safety (cognition); their actions and quality of safety management systems (behaviour); and the presence of external influences including legislation, economics, history and climate (environment/situation). Figure 3.1 adapts Cooper's model to expand the focus to include situational factors at a societal level.

Applying Bandura's theory to safety culture not only removes the limiting duality between the behavioural and the cognitive perspectives that has plagued much safety research (Cameron, 1997), but also introduces the influence of environmental factors and the importance of reciprocal determinism. This reciprocal model recognises that the strength of each element may be different in any given situation. Describing a safety culture as good/positive or poor/negative equates with the possession of characteristics identified as being effective or ineffective for controlling occupational risks to health and safety in their operating environment.



**Figure 3.1 Reciprocally Determined Model of Safety Culture**  
(after Bandura, 1977 and Cooper, 1993)



Following Bandura, Geller (1994) proposes the concept of *Total Safety Culture*, identifying *personal* (knowledge, skills, abilities, intelligence, motivation, personality); *behavioural* (compliance, coaching, recognition, communication); and *environmental* (equipment, tools, machines, housekeeping, environment, engineering) factors as key aspects of safety culture. An organisation's safety management system, the prevailing safety climate and daily goal directed safety behaviour can be measured making it possible to quantify safety culture in a meaningful way (Cameron, 1997). Attitudes are measured using a safety climate tool, work behaviour and the situational factors which influence the work can be examined and assessed.

Important mediators of safe behaviour include payment by piece rates and bonus, the blame and punishment response to loss events, and the attitude that safety is a cost that conflicts with production (Cooper, 1994). Production related bonus payments combined with risk taking group norms can motivate some workers to take risks and short cuts despite positive attitudes to safe working practices. Positive attitudes to safety will not result in appropriate management behaviour, if the company culture views safety as an unnecessary cost that slows down production. Managers must, according to Hale and

Glendon's (1987) model of behaviour in the face of danger, perceive hazards, assess the need for action and implement effective control measures. In order to achieve this managers must be empowered by training, systems, resources and positive attitudes towards proactive safety management. An individual's positive safety related attitudes may not result in corresponding behaviour due to the presence of stronger influences in the organisational culture preventing these positive attitudes resulting in safe behaviour.

### 3.1 Safety Climate

Zohar (1980), in one of the first safety climate studies, interprets organisational climate as the summary of the perceptions that employees share about their work environment that impact on safety performance. He identifies management commitment to safety as the main distinguishing feature of low accident rate factories. Safety climate is the term used to describe the aggregated attitudes of individuals within a group towards the key antecedents of safety performance, ie, management and workers attitudes and behaviours. Leather (1987) examines aspects of the complex and diverse relationships of construction site safety from a behavioural science perspective. Utilising the concept of safety climate he made the distinction between attitudes and work management regimes and stresses the interdependence between them.

*The prevailing organisational safety climate is ..., a cultural subset informed by the choices reflected in the values, attitudes and behaviours. ...individual attitudes, experiences, and behaviour are significantly influenced by the subjective perceptions of the norms embodied in and sanctioned by this prevailing organisational safety climate.*  
Leather (1987) p168

Attitudes, values, beliefs and opinions are different aspects of the cognitive process, which act as guides to behaviour in a particular group (Haralambos and Holborn, 1991). Attitudes are juxtaposed between enduring values and beliefs and superficial opinions (Glendon and McKenna, 1995). Values relate to general or universal aspects of the human condition while attitudes relate to specific objects and situations. Attitudes change in response to uncomfortable levels of cognitive dissonance and can be knowingly false (Festinger, 1957).



They are changeable, yet also capable of great stability (Haber and Fried, 1975). Though often expressed, many attitudes never result in behaviour.

Safety climate studies attempt to identify the key cognitive aspects of an organisations safety culture by surveying members expressed attitudes to the principal factors which impact on safety performance. The link between safety climate and safety performance is established, but not clear cut. Marcus (1988) in a study of 24 nuclear power plants in the US found that plants with positive employee attitudes to safety (high safety climate scores) had fewer accidents and a third fewer error events than those plants with poor safety climate scores. However, Litherland (1997) found no relationship between safety climate and safety performance of road workers. Reasons for this include, the presence within the safety culture of mediating factors which prevent positive safety related attitudes resulting in safe behaviour, eg social pressures to rush to finish work or to express false attitudes, and the subjective nature of personal attitudes in contrast to more objective behavioural measures of safety performance.

Factor analysis can be applied to safety climate data to identify the underlying factors which determine safety climate. Research has been unable to agree upon a common underlying structure of safety climate. Using a 40-item measure, Zohar (1980) produced an eight-dimensional model of safety climate, that included: management attitudes to safety, attitudes to level of risk, effects of safe conduct on promotion and the status of the safety officer. Cox and Cox (1991) identify five factors that affect employees attitudes to safety in European organisations, namely: personal scepticism; individual responsibility; safety in the work environment; effectiveness of arrangements for safety; and sense of personal immunity. HSE's Safety Climate Tool examines ten factors including: organisational commitment and communication; line management commitment; supervisor's role; workers' role; workmates' influence; competence; risk taking; rules; and procedures (HSE, 1997).

Brown and Holmes (1986) reduced Zohar's model of safety climate to three dimensions, namely employees' physical risk perception, and their perceptions of management actions and management attitudes. Dedobbeleer and Beland (1989) conducted similar studies on construction sites in the USA, producing a two-factor model of safety climate, based on employees perceptions of management's safety concerns and practices and workers' perception of risk and control over their own safety. Phillips, *et al.* (1993) distinguish between direct and indirect factors which influence safety climate. Their direct factors include: management attitudes and actions; worker's perception of risk; and work pace. These direct factors are contrasted with indirect factors, such as the status of safety officer and safety committees, which form the secondary dimension of their safety climate model. The failure to agree on a consistent structure to the underlying factors of safety climate is due to variations in questionnaire design and statistical analysis, and group, organisation, industry, and societal culture. However, the key determinant of safety climate are the safety related attitudes and behaviours of an organisation's management team (Zohar, 1980).

### 3.2 Safety Management Systems

Safety management systems include those elements of an organisation's system for management which impinge on health and safety performance. The aim of safety management systems is to prevent accidents by breaking their causal chain. The ASCNI Human Factors Study Group identify four key functions of safety management, namely policy and planning, organisation and communication, hazard management, and monitoring and reviewing safety performance (HSC, 1993). Safety management involves assessing and controlling risks, planning activities, detecting latent failures and active failures, and monitoring and reviewing performance. HSE's (1991, 1997) *Successful Health and Safety Management* (HSG 65) and British Standard *A Guide to Safety Management Systems* (BS8800, 1996) define the principles of effective health and safety management, but do not set standards. Both documents



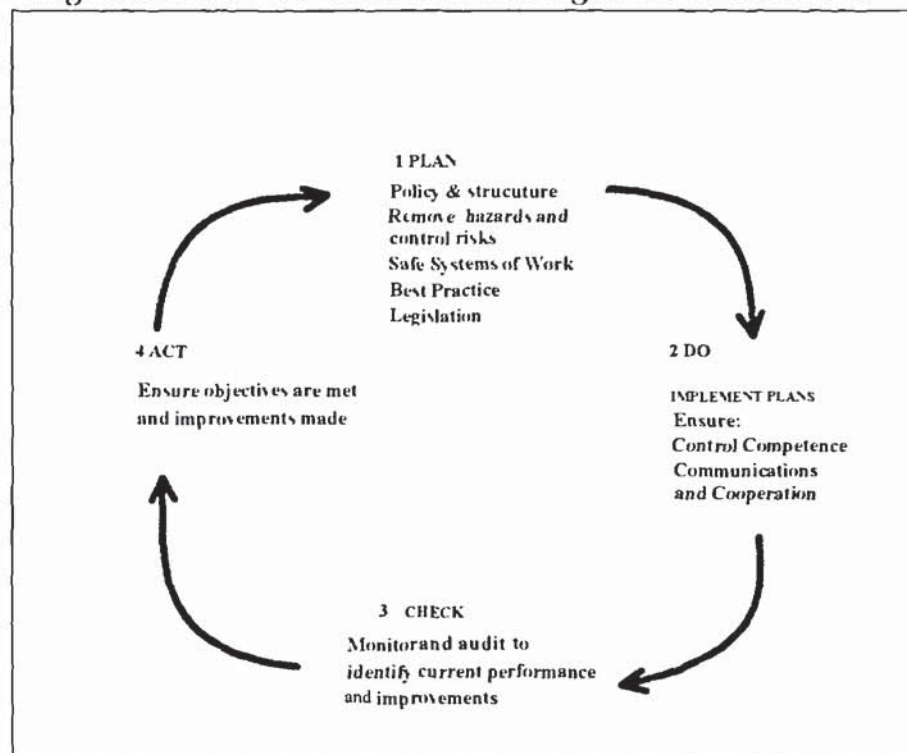
apply the principles of Total Quality Management (TQM) to safety management following the growing number of authors who highlight the links between the philosophy of TQM and safety culture (Krause, Hidley and Hodson, 1990; HSE, 1991; Pidgeon, *et al.* 1991; Geller, 1994; Cooper and Phillips, 1995; Manzella, 1997; Osbourne and Zairi 1997). Safety and quality are two sides of the same coin as both safety and quality management systems aim to establish explicit performance standards (Krause, Hidley and Hodson, 1990).

Total quality is not a programme, but a philosophy developed by Edward Deming in the USA in the 1930s which has been applied to greatest effect in Japan. Deming (1986) identifies quality control by inspection, lowest tender contracts, fear, lack of training, and arbitrary numerical targets as negative aspects of quality management. He considers targets create a climate of fear and promote short term thinking and destroy teamwork, and instead advocates democratic leadership styles, commitment to constant improvement, taking pride in work, training and senior management commitment to quality management. Quality should not be viewed as one corner of the production triangle along with time and cost, as it traditionally has been, but seen as the goal of the whole production process with time, cost and standards as the three corners of the triangle. Everyone within an organisation needs empowering and motivating to accept responsibility for the quality of their work, thereby avoiding loss and accidents and maximising productive effort. Teamwork, good communications, process monitoring procedures and commitment are key aspects of total quality management.

The fundamental basis of effective management is summarised in the simple management circle model, based on four key elements, namely: plan, do, check, act (Figure 3.2). Planning to achieve the control of risk is the vital first step in effective safety management. Effective policies emphasise: the importance of safety for the organisations performance; the need to control risk and provide adequate resources; senior management's commitment; and the need to review and improve performance. Implementing effective safety management

systems requires: control; communication; co-operation; and competence. Control comes from senior management setting examples for others to follow, taking responsibility for safety management and continually demonstrating their commitment through words and deeds. Safety training and related information needs to be readily available, and safety relevant issues should be regularly discussed. Good communications and co-operation are promoted by consulting with employees, encouraging them to express their safety views and concerns and involving them in decision-making.

Figure 3.2 Plan-Do-Check-Act Management Circle Model



### 3.2.1 Management style

The style of management adopted within an organisation has a significant impact upon the effectiveness of safety management systems. Fleishman (1953) identifies two distinct management styles, democratic and autocratic.

Democratic managers are relationship orientated, open to change, give positive feedback, and involve workers in decisions. Autocratic leaders are production orientated, stick to deadlines and criticise poor performance. The democratic, or humanistic management, style is characterised by employee participation in decision making. Participation gives workers opportunity and responsibility to



actively influence work outcomes and is linked to skill, stress and autonomy (Cooper, *et al.* 1992) Control (self-regulation) over task activities sustains effort, and to lead to continuous improvement of task activities through self-development (Bandura, 1988). It also enhances employees' self confidence, competence and independence, and reduces the need for supervision. These attributes are key causal variables in determining levels of performance, motivation and job satisfaction following Hackman and Oldham (1976).

*...participation in the workplace has positive affects on motivation, job satisfaction and performance. Cooper, Robertson, Duff and Phillips (1992) p4.*

Democratic or participatory management styles are strongly advocated by proponents of the humanistic management paradigm, (eg, Chris Argyris, Kurt Lewin, Rensis Likert, Ron Lippit, Elton Mayo, Douglas McGregor, William Ouchi, Arnold Tannebaum, etc.). These authors assert that hierarchical organisations are inevitably hostile to the needs of individuals, due to the imposition of commands by seniors imposing a state of dependence, imposition of specialisms which restrict work variety creating unsatisfying jobs and narrow measurements of performance, leading to competition and frustration. Ouchi and Price (1978) regard the use of flexible working groups (clans), as opposed to hierarchical structures, as one of the key reasons for the Japanese success story. They consider hierarchies to be inevitably harmful to the psychological success of individuals, reflecting the concerns of many authors regarding the socio-psychological affects of hierarchies and bureaucracies. In Mayo's famous Hawthorne studies at the Western Electric Company, workers chose group working in preference to the more profitable singular working option. Participative goal setting and democratic management styles correspond with increased production, regardless of physical conditions (Pugh, Hickson and Hinings; 1988). Widening the distribution of power increases productivity and satisfaction, and decreases absenteeism and turnover (Bonner; 1968). It is now a well established paradox that management increases its control by giving up authority (Tannebaum, 1966).

Following a three year programme involving workers in the management process at Wisconsin County Highway Department, compensation costs decreased by fivefold and the yearly premium halved over the three years (Lockhart and Smith, 1986). Sayers (1994) reports a 45% reduction in accident claims following the institution of participative management styles in Saskatchewan Highways in Canada. Investment in effective safety management programmes produce savings by loss reduction through increased reliability by improving management systems, particularly monitoring and feedback systems (Cooper, 1998). Effective safety management is combination of both functional and human factors, involving management control, leadership style, communications, monitoring and political will (Waring, 1991). British Standard BS 8800 (1996) states that

*"human factors, including politics and culture within organisations, can make or break the effectiveness of any management system"* BS 8800 (1996) p3.

A safety management system is the sum of the systems, attitudes and behaviours which impinge on risk control. The safety culture paradigm allows the holistic analysis of effective safety management, highlighting the complexity and importance of human factors. Key features of successful management systems, include:

- ♦ senior management commitment;
- ♦ clear objectives and communication;
- ♦ competent and trained workers;
- ♦ employee trust and participation;
- ♦ effective work planning and implementation, using risk assessment techniques; and
- ♦ performance review and feedback, monitoring and auditing.

Mismatches between job requirements and worker capabilities increase the potential for human error. Jobs should be designed to be as safe as possible taking into account limitations in human performance (HSE, 1989). Personal factors result from the fact that employees bring habits, attitudes, skills and



personality traits which all differ and may be strengths or weaknesses. Task analysis can identify the personal characteristics both in terms of physique, skills, qualifications, experience and aptitudes suitable for the job in hand. Active monitoring and auditing of current performance and the identification of underlying causes of accidents provides the information necessary to direct action at securing improvement. Successful health and safety management is based on both effective management systems and the appreciation of human factors within an organisation (Waring and Glendon, 1998).

Functionalist approaches to safety management systems focus on the techniques and mechanics of managing safety. Rules, systems, policies and procedures may encourage safe actions, but they are only as effective as the consequences they predict and the extent to which they are implemented. As procedural systems expand and become increasingly restrictive, the drive to get the job done increases the likelihood of violations being committed (Reason, 1995). Disciplinary actions temporarily stop unsafe actions from being observed, but can foster resentment and negative attitudes. Work procedures will lapse if neglected by management, or because operators are discouraged from working to them by peer group pressures and/or the presence of production related bonuses (HSE, 1989). Traditional enforcement and behaviour based safety management programmes are myopic, provide a poor return on investments, lack the power to be self-sustaining, do not place enough responsibility on management, do not promote innovation, and fail to deal with real root causes of accidents (Eckenfelder, 1997).

### *Safety Management in Britain*

Standards of safety management in major British organisations and the role of regulatory authorities, came in for harsh criticism following major incidents in the 1980s. Investigations highlighted the management decisions that led to unrealistic time-scales putting work teams under pressure to cut corners,

inadequate training and competence, and poor communications (HSE, 1991). The Piper Alpha enquiry, in particular not only criticised the safety management practices of the oil rig designers, operators, and the multinational parent organisation, but also the regulatory authorities. Following the enquiry, the responsibility for the safety inspections of offshore installations quickly transferred from the Department of Energy to the Health and Safety Executive. The Piper Alpha explosion demonstrated the susceptibility of British industry to a disaster on a similar scale to Chernobyl and fuelled the interest in the concept of safety culture. The ASCNI Human Factors Study Group state:

*Prior to the capsizing of the Herald of Free Enterprise, the Kings Cross and Piper Alpha oil rig fires, and the accident at Clapham Junction, senior managers in all the organisations shared a profound belief in the pre-eminence of safety, in the efficacy of the regulatory system, in the adequacy of their existing programmes, and in their confidence of the skills and motivation of their staff. The inquiry reports reveal that their belief in safety was a mirage, their systems inadequate; and operator errors and violations common place. The inquiry reports reveal that the ultimate responsibility lay with complacent directors managers who had failed to ensure their good intentions were translated into a practical and monitored reality. Moreover, the weaknesses so starkly revealed were not matters of substantial concern to the regulatory agencies before the accidents. HSC (1993) p10*

TQM procedures are not generally well applied to safety management, even in blue-chip British organisations (Osbourne and Zairi, 1997). Barriers to the implementation of TQM techniques to safety management, include: compliance driven mentality towards safety; leadership vacuums on health and safety at the executive level; a lack of knowledge and skill in process management; and reactive monitoring techniques. Safety is often considered to be someone else's problem and as a mere legal necessity. Empowerment, recognition, participation, team working, performance monitoring and review procedures are poorly developed in relation to health and safety management compared to the TQM systems (Osbourne and Zairi, 1997). The principal motivator of proactive health and safety management in British companies is the loss of corporate credibility (Wright, 1998).



### 3.3 Situation

At the individual level, the situational factors which influence behaviour and attitudes include peer group pressure, policies, religion, background, class, climate, tradition and environment. Organisations are intimately connected to society through their members, suppliers, purchasers, shareholders, use of technology, regulation, finance and environment. A strong societal influence often overlooked is the national and local economic climate that undoubtedly has an overarching influence on safety culture (Rosen, 1995). The age, geographic location, history, market-share, ownership, scale, type of industry, all impact on the culture of organisations.

Handy (1993) identifies four types of organisational culture, namely: power; role; task; and personal. Organisations with centralised ownership, eg family firms and those dominated by the founder, tend to be power cultures dominated and controlled by the central core. They employ people with like minded views of the founder or family and there is little bureaucracy. Organisations become more formalised as they mature and grew in size producing role cultures which rely on relatively stable bureaucratic rules (Mintzberg, 1989; Handy, 1993). The degree of external control exerted upon an organisation influences how an organisation operates. The greater the degree of control, the more centralised and formalised the organisation's systems and structures.

Person cultures exist where individuals are key and material aspects of the business are secondary, eg architects' partnerships. One-off, noncontinuous operations or those with rapidly changing technologies or markets need to be flexible and tend to be task orientated cultures based on flexible teams with expert power, typified by matrix organisations. Task cultures are job or project orientated and structured like a web or net. The strands of the net vary in thickness depending up the nature of the projects and resources devoted to them (Handy, 1993). The organisational focus is on bringing the right people together into teams that have day-to-day management control of work

methods. However, when resources are scarce, teams may compete or senior management may feel the need to impose more control leading to the development of a power culture.

### *3.3.1 Technology*

The use of technology influences organisational culture. High-tech, complex and tightly coupled industries are prone to normal accidents because of their nature (Perrow, 1984). Technology also influences bureaucracy, professionalism and control systems (Mintzberg, 1989). Labour intensive operations breed a results orientated culture characterised by a top management team with a relatively low education level, promotion from the ranks and low union membership (Hofstede, 1994). The use of expensive technologies producing high quality products tends to produce role cultures which encourage close monitoring and control of operations.

Technology, industry and economic development are central features of the current world order. The use of technology and industrial development, not only creates benefits to individuals and society but also associated hazards and risks (Douglas and Wildavsky, 1982). The revolution in industrial production exposed workers of all grades to physical and psycho-social hazards associated with work (Schilling, 1981). Traditional cottage industries provide the hand loom weaver or potter the opportunity to work at their own pace and take breaks to cultivate their land. In the factory weavers and potters become exposed to the pressure of continuous work at speeds imposed by the needs of production. The socio-psychological effects of technology upon the work environment and upon society as a whole are important aspects of many cultures. Today in the developed world the biggest killers in society relate to the use of technology, either directly in the case of road transport, or indirectly through lifestyle resulting in heart disease and cancer.

*..the major causes of death are lifestyle: between the ages of 5-35 road accidents; between 40-70 smoking and dietary or alcohol excess. Douglas and Wildavsky (1982) p.45*



### 3.3.2 Regulation

Characteristics of mature industrial societies, include increasing social and political emphasis upon safety regulation and training (HSE, 1991b). The methods adopted to ensure the effectiveness of industrial health and safety legislation varies between the two extremes of compliance focused and sanctioning focused strategies. The regulation of occupational health and safety also impacts on the safety culture of organisations by setting rules and standards to follow. Factors that impact upon the style of enforcement strategy include the numbers and sizes of companies to inspect, source of inspector recruitment, degree of inspector specialisation, industrial development, use of technology, concepts of crime and punishment, and cultural bias. Compliance strategies emphasise proactive techniques of inspection and monitoring, viewing prosecution as a sign of failure. Sanctioning strategies, in contrast, focus on prosecution and punishment and are primarily reactive with a tendency to concentrate on the discovery of violations and the prosecution of duty holders. Large numbers of small companies to inspect, recruitment predominantly from outside industry and general rather than specialist inspectors, all promote greater use of legal sanctions.

The preferred form of enforcement strategy rests ultimately on the states and its officials beliefs about retributive punishment and the preventive effects of criminal sanctions (Hawkins, 1992). The French make a greater day-to-day use of criminal sanctions than the British, and both make a very much greater use of them than any other European country (Campbell, 1986; HSE, 1991). The Americans follow more formal regulatory processes and enforce their regulations with greater degree of stringency than do their British counterparts (Hawkins, 1992). The Australians moved away from a focus on enforcement strategies towards compliance strategies based on the evaluation of risk and harm. America "*is the epitome of rampant legalism*" because history has encouraged individualistic, self-assertive values, rather than deferential ones promoted by the class systems of European history (Hawkins, 1992). In

contrast, the proactive compliance strategies are common among Scandinavian Inspectorates because of a high degree of trust between social partners in society. The HSE is bureaucratic, hierarchical and technocentric, true to British hierarchical cultural bias. Despite the drive for conformity, differences exist across the EU in the formulation, standards and enforcement of occupational health and safety legislation in different countries (Campbell, 1986; EC, 1990; HSE, 1991b; Hawkins, 1992).

### ***3.3.3 Tripartism***

Involvement of social partners is a significant aspect of the institution arrangements in most industrially developed countries, but takes different forms. Employers and trade unionists sit on advisory tripartite commissions and the governing bodies of their respective research institutes in France, Italy and Spain. In no EU country, however is the determination of policy (and the preparation of regulations) at national level the responsibility of a tripartite commission, as in the case of Britain (Hawkins, 1992). In France, Germany, Italy and Spain, trade unions exercise substantial influence on company policy and practice through joint committees that oversee the management of health and safety at the workplace. There is a right to stop work under specified circumstances in Belgium, Denmark, France, Germany, the Netherlands and Spain. German companies have work councils for consultation on a wide range of industrial relations issues.

## **3.4 Typologies of Safety Culture**

The Fifth International Nuclear Safety Forum (1995), following the functionalist paradigm singled out four characteristics of positive safety cultures, namely: a focus on safety; sound technical basis for decision making; rigorous self-assessment; and a disciplined approach (Rosen, 1995). They identified complacency; emphasis on production; minimum compliance with regulations; and a lack of accountability as characteristics of poor safety cultures. The Tokyo workshop participants produced a list of the top ten influences on safety



culture, which corresponds with Schein's (1992) typology of cultural influences on organisations highlighting management's role, namely:

- ♦ what manager's pay attention to, measure and track;
- ♦ reactions of supervisors to critical incidents;
- ♦ allocation of rewards, status and punishment;
- ♦ deliberate role modelling and coaching;
- ♦ criteria for selection, promotion and termination;
- ♦ processes and procedures;
- ♦ organisational structure;
- ♦ design and use of physical space;
- ♦ formal statement of policy; and
- ♦ open communication.

Less functionalist approaches place more emphasis on the importance of human factors. The CBI (1990) identify senior executives and line management concern and commitment, employee involvement and open communications, as key aspects of positive safety cultures. A free flow of information, devolution of responsibility to employees, and encouraging all to behave in an open and responsible way are characteristics of positive safety cultures (Turner, 1992). The ACSNI study group identify mutual trust, good communications, shared perceptions of the importance of safety and confidence in current practices as characteristic of positive safety cultures (HSC, 1993). In the nuclear industry total quality management techniques are being employed which encourage staff to contribute to management decisions and to develop a sense of ownership (Rosen, 1995). Partington, *et al.* (1995) distinguish 16 key aspects of positive safety cultures, including: understanding and commitment; support and encouragement; team working; participative decision making; and the fundamental value of safety.

### 3.4.1 Total Safety Culture

Geller (1994) draws upon values and behaviours advocated in total quality management in describing the key factors characteristics of a *Total Safety Culture* (TSC). TSCs adopt the TQM philosophy of working to achieve success rather than avoiding failure, by ensuring quality of process rather than reactive inspection. The desire to achieve risk minimisation is the driving force, not legal compliance. They reward good performance, encourage team building, empowerment, win/win thinking, good communications and feelings of self-esteem. Negative aspects of the work environment are removed, (eg production and risk related bonus payments), and positive antecedents implemented (eg, safety training). TSCs concentrate on process not outcomes because a narrow focus on outcomes is like watching the scoreboard, rather than the ball, when playing tennis (Geller, 1994). The synergy of motivated and empowered work teams ensures the whole is greater than the sum of the parts. Employees actively care for safety and go beyond the call of duty to identify unsafe conditions and behaviours and intervene to correct them (Geller, 1994). Safety coaching is an important aspect of a TSC, involving communicating, observing, analysing, changing, and helping others at work to achieve improved safety performance.

### 3.4.2 Four types

Shilliton (1995) identifies four categories of organisational safety culture, namely the *rule book*, the *engineered*, the *procedural* and the *behavioural culture*. Characteristic management attitudes in the *rule book* culture, include regarding workers as lazy, carelessness, and in need of constant motivation and management discipline. Workers should learn rules by heart because cannot be expected to think for themselves. The *engineered* culture considers that engineers should eliminate all possible sources of harm. The *procedural* culture treats workers with more respect than the *rule book* culture, but still considers workers are careless and forgetful, and in need of constant motivation (Shilliton, 1995). Motivation is achieved by rephrasing rules into policies,



objectives and targets. The *behavioural* culture considers workers are normal human beings who are motivated to work by many factors. Responsible behaviour occurs when workers receive appropriate training, are empowered and accept responsibility for their work. The *behavioural* culture still contains policies and objectives and targets, procedures, manuals, records and audits, but sees these as tools to aid the performance of empowered teams.

### 3.4.3 Maturity Grid

Eckenfelder (1997) proposes a five-stage maturity grid of safety culture ranging from ignorance to perfection, based on ten key values. Key values include a concern for safety, integration of safety into the production process, recognition that safety management is a never ending process, putting the right people in the right places, using appropriate measures, and empowering staff.

Characteristics of the ignorance stage of the maturity grid, include safety being: driven by regulations and costs of accidents; seen a separate part of the management process; governed by quick fixes; managed by anybody; and based solely upon inspection and compliance. Safety is a burden, accident rates are the only measure of performance and safety is last when allocating funds. Characteristics of a fully mature safety culture, include a sincere and continuous concern for employees and their safety, safety is seen as a profit centre not as a cost, and loss prevention measures are fully integrated into the business. The IAEA (1998) provide a simpler development scheme of safety culture identifying three different stages: *Rule and Regulation*; *Organisational Objective*, and *Continuous Development* (Table 3.1 ).

**Table 3.1 Stages of Development of Organisational Safety Culture (based on IAEA, 1988)**



#### ***3.4.4 Cultures within organisations***

An organisation's culture is not homogenous, but varies across the structure of the organisation. Within organisations there are sub cultures which form around different roles, functions and levels of power. Most organisations have separate executive, management and worker cultures (Williams, Dobson, and Walters 1989; Schein, 1997). The executive culture is shared by directors and senior managers who hold common beliefs about strategic direction and appropriate behaviours. The management culture focuses upon management and resource issues, while the blue colour culture is focused on production and rewards received. Schein (1997) includes engineers and technology in the management culture category. These three cultures often do not understand each other and work at cross-purposes. Operators know that rules they should follow do not always work in the real world, engineers prefer technical and impersonal solutions to problems, while senior managers distanced from day to day operations, tend to view people as costs. Both the management and



executive cultures are primarily task focused and consider people to be a problem, either as costs or sources of error (Schein, 1997). To work effectively an organisation must ensure the different cultures can communicate with each other.

Management attitudes and behaviours are crucial factors in the culture of any organisation. The higher in the organisation hierarchy the greater the influence a manager can exert on the culture. Leadership or management style has a fundamental influence on the culture of an organisation. Early work on leadership concentrated on personality traits, following the elitist theory that leaders are born, not made. This approach had little success and efforts turned towards examining behavioural styles of leadership in the belief that effective leadership techniques can be learnt (McKenna, 1994). Deal and Kennedy (1982) consider that those organisations with strong cultures have heroic managers who act as bullies and heavies, contrary to the views of humanistic management theory. Organisational heroes develop when individuals get a large degree of control over their own destiny and self-actuate through their role in the organisation. These heroic-type of people, who tend to dominate managerial positions in organisations, have a high potential for being dysfunctional because their narrow world-views leave them prone to crises (Pauchant and Mitroff, 1992).

### **3.5 Summary**

Some critics of the safety culture paradigm consider it to be a fad (Back and Woolfson, 1999), a catch all for human factors issues and a concept without substance (Cox and Flin, 1998). The lack of precise definitions of safety culture, the traditional functionalist and technocentric bias of the safety discipline and the confusion between safety climate and safety culture studies has fuelled scepticism regarding the utility of the paradigm. However, studies of high reliability organisations (HROs), ie those with excellent safety management records, emphasise the importance of understanding how HROs

work from a cultural perspective (Roberts and Rousseau, 1989; Roberts, 1990 and 1992; Rochlin, 1993.). Studies by Lockhart and Smith (1986), Coote and Lee (1993), Sayers (1994), and Guest, *et al.* (1994), demonstrate that low accident frequency units/organisations are characterised by positive management attitudes to safety and the empowerment of workers (Cox and Flin, 1998). The safety culture paradigm provides a global characteristic for identifying the deep-rooted preconditions of accidents (Pidgeon, 1991). Despite it's lack of precisely quantifiable parameters, the safety culture paradigm directs consideration of cultural blind spots which have been overlooked by previous safety paradigms.

Organisational culture, following the functionlist paradigm, is viewed as part of an organisation along with structure, strategy, systems, style, skills and staff. Culture is considered to be something that can be bought in or added on by management. Pauchant and Mitroff (1992) following the cognitive paradigm, view organisational culture as the basic assumptions which motivate behaviour, which is a subset of societal culture with existential functions. An organisation's culture is a socio-technical systems involving, the interaction of personalities in decision making processes, planning and control procedures, technology, resources, etc. Leadership styles and the use of power are important determinants of organisational culture, which are variable and affected by personality and situational factors. Externally, organisations are embedded in the wider socio-technical systems including political, legislative, economic and technological systems (Williams, Dobson and Walters; 1989). Culture varies both between and within organisations. Risk, feedback, technology, ownership, power, history, size, specialisation, environment and people all impact on the cultures of organisations. Figure 3.3 depicts the key positive influences on safety culture identified by the IAEA (1988).



**Figure 3.3 Positive Influences on Safety Culture (IAEA, 1998)**



Positive safety cultures focus on the people aspects of an organisation (Eckenfelder, 1997). Erickson (1997) identifies management systems, management concern and positive employee setting as crucial determinants of safety performance, and asserts that positive employee setting is the most predictive factor of safety performance. Positive employee setting includes work environment, management actions and behaviours, communication, treatment of employees, innovative thinking, management feedback, employee commitment, employee morale, organisational fit of employees and ethics. There is increasing acceptance that there is a need to encourage staff to adopt a questioning attitude; search for ways to improve safety; constantly be aware of what can go wrong; and feel personally accountable for safe operations. The

most important indicator of a positive safety culture is the extent to which employees are involved in safety management (Cooper, 1998).

Within organisations, those holding the primary positions of power play a key role in influencing culture. Leadership commitment to safety, resilience through redundancy, empowered employees and organisational learning as the key essential features of *high reliability organisations (HROs)* (Horbury, 1996). Rochlin (1993) identifies, inter alia, constant vigilance to risk reduction following contingency and quality management styles as characteristic of *HROs*. The most successful safety cultures are those that see risk as omnipresent, dynamic and manageable. They are proactive in dealing with potential problems through competent, empowered, trusting employees. They develop a just culture based on good communications with clear distinctions between tolerable and culpable behaviour, rather than a no blame culture (Pidgeon, 1998a; Reason, 1998). They are committed to continuous improvement and spend time preparing and reviewing operating plans and procedures.

From the social science perspective, safety culture is an important theoretical concept which explicitly examines some of the more elusive contributions to accident incubation addressing the wider social causes of accidents (Pidgeon and O'Leary, 1994). Fujita, *et al.* (1993) and Rosen (1995), identify societal cultural differences as playing a significant role in determining the performance of nuclear power plants, influencing management styles, educational requirements, shift transfer procedures, adherence to written procedures, use of automation and standards of housekeeping. Figure 3.4 summarises the key factors which impact upon safety cultures using Bandura's reciprocal model. This model is used as the conceptual framework for this study (see Chapter Seven). The following chapter examines the impact of societal culture on safety culture and risk perception



**Figure 3.4 Reciprocal Social Cognitive Model of Safety Culture**  
(after Bandura (1977, 1986) and Cooper and Phillips (1995))



## ***Chapter Four: Safety Culture and Society***

This chapter examines the relationships between safety, risk, culture and society. It covers the cross-cultural work on organisational culture and safety culture. The concept of risk and issues relating to risk perception are examined and related to grid/group theory. It briefly reviews some of the key texts from the literature relating to organisations and societal culture.

Safety culture is the dynamic emergent property of human activity at the nation, race, region, organisation, departmental or interest group level (Waring, 1994). An organisation's safety culture cannot flourish without interacting in harmony with the prevailing societal culture (Meshkati, 1995). Reason (1997) speculates that societal influences can help explain and predict the causes of accidents. The societal forces that dictate prevalent attitudes and behaviours relating to safety within a given culture are fundamental to the study of safety culture.

*In order to assess safety culture it is necessary to identify the processes and attitudes that have an impact upon safety related behaviour. Since culture is a dynamic entity that is continuously changing, a clear understanding of the cultural forces that impact upon safety is necessary. Philips, et al. (1994) p2*

Psychologists and anthropologists consider that people experience the world through cultural filters derived from earlier experience. Cultural norms, behaviours and attitudes are associated with deep seated values. Rokeach (1973) defines a value as an enduring belief that a specific mode of conduct or end state is preferable to another. Haralambos and Holborn (1991) cite the case of the Sioux Indians who value generosity and consider the acquisitive European as peculiar, grasping, self-seeking and antisocial. Values have strong motivational, cognitive, effective and behavioural components (Rokeach, 1973). Many cultural norms can be the expression of one value. Shared values are essential for the operation of human society, defining modes of conduct, eg



honesty, loving, and end states, eg freedom, equality, and wisdom. Schein (1985) identifies five basic assumptions around which cultural paradigms form:

- ♦ relationship to nature - dominance or harmony;
- ♦ truth and reality - time, space, science, language;
- ♦ human nature - good, evil, changeable;
- ♦ human activity - passive, aggressive, fatalistic; and
- ♦ human relationships - competition, co-operation, individualism, power, love.

Park (1950) identifies two great cultural divisions in the human race, the oriental and the occidental. Each has its own different values, philosophies, mores and notions of what societal arrangements are advantageous. Eastern or oriental culture is characterised by reflection, Western or occidental culture is characterised by mobile action. In a mobile society such as America the influence of tradition is minimised and the emphasis is on competitiveness rather than altruism (Barash, 1979). Fashion and public opinion take the place of custom as the means of social control. The individual is emancipated, but society is atomised, affecting people's sense of inner security (Park, 1950).

Theories about organisational behaviour are influenced by national cultural (Hofstede, 1980). Fayol, a French engineer, conceived organisations as pyramids of people differentiated by personal power and formal rules. Weber, a German academic, described bureaucracies as rational, well-oiled machines, with authority resulting from the rules used to run them. Taylor, an American engineer, divided work up into individual tasks to achieve greater efficiency. Ouchi, a Japanese-American, stressed the importance of the clan culture of co-operating groups of workers and organisations.

As multinational corporate operations proliferate, it is becoming increasingly important to be aware of the impact of societal culture upon organisational culture. American ideals of company first and working to time deadlines,

conflict with business ideals which favour personal relationships and view time deadlines as rude, pushy and ignorant. Americans and Britons consider it rude and disrespectful to be kept waiting, however, it is not such an issue in many other countries, eg in Ethiopia the time required for a decision is directly proportional to its importance. Understanding the impact of societal culture upon safety culture allows the identification of the antecedents of safety related attitudes and behaviours. Specific characteristics of societal culture can have a positive or negative effect upon how risk is controlled in an organisation. Each culture has characteristics which impact both positively and negatively upon safety culture (IAEA, 1998). Risk perception; motivation; work group dynamics; and attitudes to work, technology, hierarchy, time, religion and stereotypes are important culturally based attitudes and behaviours that impact on safety culture (Meshkati, 1995).

#### **4.1 Cultural Analysis**

The aim of cultural analysis is the clarification of behaviours and values implicit and explicit in a particular culture. There are two main paradigms in cultural theory, the structuralists and the culturalists. Structuralists consider that arts, crafts, language, science, political organisation and institutions, etc. are merely the extension of structures and functions that characterise a cultural group. Culturalists consider culture to be a particular way of life with characteristic behaviours and values. Hall (1981) advocates combining the two elements of cultural theory with Gramsci's hegemony theory for cultural studies. Hegemony is important because it moves the concept of culture away from the elitist and evolutionist schools of cultural thought, leading to the post modernist view of culture that no longer recognises the distinction between high and popular culture (Storey, 1993).

Representation, identity, production, consumption and regulation are the five major cultural processes (Hall, 1997a). Together these processes form a circuit of culture (Figure 4.1). In the real world these parts of the circuit continually



overlap and intertwine in complex ways. All these cultural processes involve the question of shared meaning and the practices that produce meanings. Shared meanings result from the use of language through the cultural process of representation. Meanings are not absolute and fixed because they are the products of a complex social process and are not therefore inherent but rather are constructed by people sharing the same culture. The cultural circuit provides a holistic framework to examine the master patterns underlying cultural products.

Representation is the active expression of meaning through language. It is the relationship between the signifier and signified which produces meaning and sustains representation (Hall, 1997a). Foucault introduced the broader concept of discourse that includes the influences of history and power on knowledge and meaning. The concept of discourse widens the focus of representation from language to include practice as well. It is discourse that produces meaning, not the object itself. A stone can be a weapon, a tool, or an ornament depending upon the context of use.

Figure 4.1 The Circuit of Culture (Hall, 1997a)



Identity is the point in the cultural circuit where personal experiences and cultural setting interact. Essentialists believe that identity stems from an essential biological or cultural core, while constructionists consider that identity develops through cultural meaning. Identity is intrinsically political because it is about marking social boundaries between groups of people, eg nation, race, and region. The concept of diaspora, however, moves the understanding of identity away from being grounded in geographic location, to a more complex and interactive process.

The production and consumption of cultural artefacts are not just related to technology and economics, but are also concerned with meaning, eg the success of the Sony Walkman is a product of technology, Japanese economic hegemony, youth culture, the concept of personal space, etc. (Hall, 1997a). Regulation is the outcome of the way in which the economic, political, cultural and social realms interact at a particular period. Cultural regulation is about the formal and informal negotiation of representations, involving moral judgements and power relations. It involves material aspects, symbolic meaning and the sanctions imposed for breaking the rules. There are different forms of regulation, including: law, ethics, religion, etc. The regulatory process is, following Foucault, part of the process of discourse and includes deregulation and re-regulation aimed at producing subject-identities which seem natural, inevitable and right (Thompson, 1997).

Buildings represent both structures for activity and symbols of power, reflecting identity, produced by the construction process, consumed by different groups and regulated by various government agencies. The construction of buildings requires material resources, physical skills, knowledge and the co-ordination of information and activities of different people and organisations. Construction is a cultural process based on systems of meaning, institutionalised cultural knowledge and normative understanding (Hall, 1997b).



## 4.2 Risk and Society

The perception of risk is multidimensional, with a particular hazard meaning different things to different people depending, for example, upon their place in history and their underlying value systems (Pidgeon, 1992). Most of the dangers that we face are to a great degree dependent and generated by the activities of our society. The dangers that people emphasise and the dangers that they ignore are, in part, already selected by the groups and the society to which they belong (Turner, 1992). Adams (1995) cites the example of slipping on ice is a game for children but is a potentially fatal hazard for old people, the two perspectives viewing the world and appropriate behaviour, differently. Size of country, level of technological development and occupation influence risk perception (Goszczynska, Tyska and Slovic, 1991). Societies that live by hunting and fishing experience different dangers to nuclear societies. In industrially developed nations natural events are labelled as disasters by an ideology which maintains that technology can control nature, while less technocentric societies consider the same disasters to be part of the human existence (Adams, 1995). For several centuries, between the Renaissance and Reformation, the Church provided explanations of the unknown through witchcraft (Clark, 1980). Throughout history the poor are at greater risk than the rich within most societies.

*The history of risk distribution shows that, like wealth, risks adhere to a class pattern, only inversely; wealth accumulates at the top, risks at the bottom. Beck (1992) p.35*

Contrary to modernist thinking, universal cognitive absolutes do not apply to risk perception. Risk perception cannot be reduced to a single subjective correlate or a specific mathematical model of risk because it is complex human and social phenomena. (Pidgeon, *et al.* 1992). Attributes of hazards found to affect risk perception include: benefits; severity; origin; time scale; controllability and familiarity (HSC, 1993). Risk perception involves judgements about the physical characteristics of hazards, consequences, and social and organisational factors such as credibility and trust. In perceiving risk, people often act less as individuals and more as social beings who have

internalised social pressures and often delegated their decision-making process to institutions and society (Douglas and Wildavsky, 1982). Familiarity is often socially determined, eg, hazards such as car driving, nuclear radiation, pesticides, etc. are established aspects of modern society. Material and social benefits are automatically assimilated into people's risk perception process, with high benefits decreasing people's perception of risk (HSC, 1993). People are more sensitive to hazards that are invisible, eg nuclear radiation, than to those which directly threaten themselves, to those which they believe they have control over, and to those which occur in the short term. Trust is an increasingly important issue in risk perception that relates to responsibility, blame, the degree of choice and control enjoyed by those at risk, and the mechanisms used to express people's views (H.M. Treasury, 1996).

Risk takers justify their actions by considering relevant risks to be benign because of their focus on the positive, rather than negative outcomes of risk taking behaviour (Pederson, 1995). In the industrial work environment the perception that safety competes with productivity often results in poor hazard management and deliberate risk taking to maximise productivity and minimise expenditure. Cotgrove (1982) refers to the optimistic cornucopian outlook that is a prevalent and necessary part of risk taking entrepreneurial culture. Adams (1995), following the work of Wilde (1976), developed a *Risk Thermostat* model in which the propensity to take risks is a function of rewards, experience and perceived danger, and the balancing of behaviour produced by their interaction. Cultural filters are a key part of this model influencing risk taking behaviour by dictating the perception of hazards and rewards (Figure 4.2).



**Figure 4.2 The Risk Thermostat Model (Adams, 1995)**

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Risk homeostasis theory predicts that some workers will increase their risk taking behaviour when safety measures reduce the actual levels of risk. This conceptual model considers that:

- ♦ everyone has a propensity to take risks, which varies between people;
- ♦ this is influenced by the rewards of risk taking;
- ♦ perceptions of risk are influenced by experience;
- ♦ individual risk taking decisions are a balancing act where risk perception is weighed against propensity to take risks; and
- ♦ the greater the risk taking behaviour of an individual, the greater will be both the rewards and losses they incur.

The theory can be criticised for methodological shortcomings, the incomparability of traffic behaviour and work behaviour, the ambiguity of results, and the nature of the influence of risk perception on behaviour (Hale and Glendon, 1987; McKenna, 1994). The theory is also dubious because it

relies on people having target levels of risk that are relatively constant over time and general in application. Landeweerd, *et al.* (1990), from their examination of construction worker risk taking behaviour, consider that their findings do not offer any support to risk homeostasis theory. Adams (1995), however, states that it is a conceptual theory that offers an insight into the nature of risk taking behaviour, rather than a mechanistic model. Its value lies in highlighting the complex nature of the interaction of experience, perception, behaviour and culture influencing risk taking behaviour.

#### *4.2.1 Cultural Bias and Grid/Group Theory*

According to the cultural perspective, the perception of both the nature of hazardous events and the probability of risk occurring, are culturally influenced. Culture provides a collectively held set of customs and meanings, which are internalised and become part of personality. Attitudes towards risks and dangers are not homogeneous, but vary according to cultural biases. The risks a group identifies and their response to them depend on the core values and beliefs that the group share. One of the major changes to orthodox psychological approaches to risk perception came from the grid/group cultural theory proposed by the anthropologist Mary Douglas.

In grid/group theory *group* refers to the extent to which the individual's choice is subject to group determination, while *grid* relates to the degree to which externally imposed prescriptions dictate individual's lives (Figure 4.3). The more binding and extensive the scope of social prescriptions, the more the rules dictated by social status restricts individual choice, and the less life is open to individual negotiation (Thompson, Ellis and Wildavsky, 1990).



Figure 4.3 Five Cultural Biases (Thompson, Ellis and Widavsky, 1990)



Strong group boundaries coupled with minimal prescriptions produce social relations that are egalitarian. Where strong group boundaries and binding prescriptions exist, social relations are hierarchical. Where neither group incorporation nor prescribed roles exist, social relations are individualistic and boundaries are provisional and subject to negotiation. Binding prescriptions and exclusion from group membership, exemplify the fatalistic way of life. A less common way of life is that the hermit who withdraws from cohesive and manipulative social involvement altogether. Grid/group theory, despite its reductionist nature, expands the conceptual agenda for both risk research and cross-cultural sociology (Dake, 1991; Weyman, *et al.* 1999). Grid/group theory is a useful tool for studying values, attitudes and behaviours and how they are linked to social structures and cultural biases.

Cultural theorists consider that individuals choose what to fear and how much to fear it, to support their life-view. Both hierarchists (positive group, positive grid) and individualists (negative group, negative grid) are attracted to technology. Individualists seek technology as a means to expand opportunities, hierarchists view it as a way to make good on the promise of a

better life (Thompson, Ellis and Wildavsky, 1990). Hierarchists are concerned about order, individualists about economic issues. Egalitarians are concerned about the negative consequences of the use of technology and societal risk taking, and are expressive, argumentative and assertive with strongly liberal political orientations. Individualists tend to measure success in material terms and value freedom, forthrightness, pragmatism and risk taking. They believe that the world is a tough place, and human skill and daring dictate the game of life. Hierarchists are famous for shifting blame onto deviants who do not know their place and must be subject to re-education, while egalitarians reject authority, believing that the system is at fault (Thompson, Ellis and Wildavsky, 1990).

The way in which each cultural bias views nature is key to understanding their characteristics (Thompson, Ellis and Wildavsky, 1990). Fatalists consider nature to be capricious, with luck being the key determining factor. For egalitarians nature is ephemeral and therefore requires careful management to maintain it and prevent damage. Hermits view nature as a freely available cornucopia. Individualists consider that nature is benign and forgiving, and is therefore a cornucopia to exploit by their own skills, for their own benefit. Hierarchists view nature as tolerant and bountiful, but is also vulnerable to abuse and therefore requires a degree of management and control. America brings together individualism and egalitarianism, weakening hierarchy (Thompson, Ellis and Wildavsky, 1990). Britain combines hierarchy and individualism limiting egalitarianism. Both these ways of life play down long term risks because their sights focus on short-term immediate dangers and they expect their innovation or expertise to be able to counter distant dangers. The combination of egalitarianism with hierarchy equates with the Swedish model of democracy.

Individualists are self conscious risk takers believing in no pain no gain and of no risk, no reward. Individualists take a pragmatic view of cost benefit analysis. They collect information about risk to assist their gambling decisions



(Adams, 1995). Hierarchists try to reduce risk by adopting a paternalistic approach to risk regulation, which seeks to persuade and prevent people from putting themselves at risk. Hierarchists are usually responsible for putting safety measures into affect and commonly find themselves lobbied by egalitarians to reduce risk and by individualists insisting on less control, while fatalists see no point in arguing. Reliance on cost benefit analysis (CBA) as the basis for risk management decisions betrays a hierarchical cultural bias. Egalitarians question the morality of the hierarchists using CBA as an example of their crass materialism. CBA is based on the assessment of the economic value of different options and only polarises dispute about risk (Adams, 1995). Aboriginal people in Australia base their opposition to mining developments on their perception of the land being sacred. CBA cannot cope with the fact that Aborigines consider that money cannot buy or compensate them for the loss of what they hold as sacred.

#### *4.2.2 Risk perception*

Risks are exaggerated or minimised according to their social, cultural, and moral acceptability. Increasing concerns about industrial risks can only be understood through social and cultural analysis and interpretation (Covello and Johnson, 1987). Thompson, Ellis and Wildavsky (1990), argue that cultural values and beliefs are not free to come together in any which way; but are closely tied to social relations. Social relations generate preferences and perceptions that in turn sustain those relations across a wide range of social phenomena, including blame and risk perception. The basis of the essential unity and diversity of human experience, regardless of time or space, is that individuals always face five ways of relating to other human beings (Thompson, Ellis and Wildavsky; 1990).

Grid/group theory advocates a high degree of pattern and consistency when dealing with societal risk, providing a typology for organising responses to uncertainty, with each cultural type holding a distinctive view of how, or whether, risk might be managed better (Adams, 1995). Safety professionals are

egalitarians who adhere to the myth of nature ephemeral and promote the zero accidents philosophy. Fatalists consider that we cannot manage risk better, because life is unpredictable. Individualists want a devolution of responsibility from bureaucracies to the individual. Egalitarians favour the exercise of caution and co-operation, while hierarchists advocate more research and regulation.

Grid/group theory only offers a partial, reductionist explanation of responses to risk because it simplifies a complex and chaotic process, into five static cultural stereotypes (Bellaby, 1990; Pidgeon, *et al.* 1992; Adams, 1995; Bloor, 1995; Weyman, *et al.* 1999). However, viewing the five biases as interactive rather than static model with two axes of grid/group theory as continua, offers an insight into the production of culturally constructed, plural perceptions of risk (Gabe, 1995). In reality people have elements of all the five ways of life demonstrated by the way in which people react to different issues at different points in time. People will be fatalistic about risk when they feel that they have no power to control events. When people believe that a risk greatly outweighs the benefits accrued they may adopt an egalitarian stance, demonstrated by members of Greenpeace, CND, Friends of the Earth, etc. People in government with the power to make decisions, adopt the hierarchist position based on the paradigm of limited bureaucratic control.

### **4.3 Societal Cultural dimensions**

Hofstede (1980) identifies four key cultural dimensions at the societal level: social inequality including the relationship with authority; the relationship between individuals and the group; concepts of masculinity and femininity; ways of dealing with uncertainty including the control of aggression and the expression emotions. These four dimensions group together a number of social phenomena which occur in combination. Schein (1985) identifies five basic assumptions around which cultural paradigms form, namely: relationship to nature; truth and reality; human nature; human activity; and human



relationships. Hofstede (1994) adds a fifth dimension to his analysis of differences among societal cultures, namely that of a long-term orientation versus a short-term orientation to life. Hampden-Turner and Trompenaars (1993), in a study of the seven most economically successful countries, identify seven cultural dimensions, namely:

- ♦ universalism v particularism;
- ♦ analysing v integrating;
- ♦ individualism v collectivism;
- ♦ inner-directedness v outer-directedness;
- ♦ time sequential v time synchronising;
- ♦ achieved status v subscribed status;
- ♦ equality v hierarchy.

Hampden-Turner and Trompenaars (1993) cultural dimensions combine many aspects of Hofstede's (1980) categories, but correspondence between the two is not always perfect. The cultural dimension of individualism is a key feature of the dimensions identified by all three schools of analysis (Table 4.1).

Individualism is one of the principal ways of relating to other people (Thompson, Ellis and Wildavsky; 1990). The status and equality dimensions identified by Hampden-Turner and Trompenaars (1993) can be combined with Hofstede's Power Distance dimension to form a single power dimension.

Cognitive factors include Hampden-Turner and Trompenaars' (1993) dimensions of: universalism/particularism; analysing/integrating; and time sequential/time synchronising. Situational factors include the male female dichotomy, technology, economics and nature.

Table 4.1 Dimensions and Factors Emerging from Cultural Theorists.

Influencing Factors	Schein (1985)	Hofstede (1980, 1994)	Hampden-Turner and Trompenaars (1993)	Thompson, Ellis and Wildavsky (1990)
<b>Cognition</b> truth reality time personality locus of control trust uncertainty risk	Nature of truth and reality Human nature	Time Uncertainty avoidance	Time: Synchronous / Segmented Analysing/ Integrating Universalism /Particularism	Individualism Egalitarian Fatalist Hierarchist Hermit
<b>Behaviour</b> activity relationships power and hierarchy communication leadership participation	Human relationships Human activity	Individualism Power distance  Femininity/ Masculinity	Status Hierarchy Individualism Inner directed/ Outer directed	
<b>Situation</b> technology development resources history biology and nature climate legal system competition		technology climate legal systems		

The cognitive process, including attitudes, beliefs, values, perceptions, etc., influence both human behaviour and the human situation. Key cognitive cultural factors include perceptions of nature, risk, time and uncertainty. The norms of behaviour, communication, discrimination, power, leadership and hierarchy are also key indicators of cultural bias. The key situational factors which influence cultural bias, include biology, climate, technology, industrial development, resources, history and competition. Five key cultural dimensions can be identified, namely uncertainty avoidance, individualism, hierarchy and power, time and gender.

#### 4.3.1 Uncertainty avoidance



Uncertainty avoidance is the extent to which the members of a culture feel threatened by uncertain or unknown situations (Hofstede, 1994). It is related to Durkheim's concept of anomie, to stress and to risk taking (Hofstede, 1980). Low uncertainty avoidance scores equate with a greater willingness to take risks. However, in his later work he warns that uncertainty avoidance should not be confused with risk avoidance: uncertainty is to risk as anxiety is to fear (Hofstede, 1994).

Low uncertainty avoidance bias is associated with achievement motivation, ambition, the hope of success, high levels of employee mobility and low levels of worker satisfaction. McGregor's Theory X (workers lazy) is supported and conflict and change are seen as inevitable. Broad outlines rather than detailed instructions are preferred, rules are viewed as flexible and there is little expression of emotion or anxiety. Many of the north-west European countries including the British, show a bias towards low uncertainty avoidance (Hofstede, 1980). High uncertainty avoidance correlates with high anxiety, concern about the future, a fear of failure and risk avoidance. High uncertainty avoidance cultures value large organisations, steep hierarchies, expert status, high levels of co-operation, team work, loyalty and the expression of emotions. Workers are considered willing following McGregor's Theory Y, competition is not encouraged and detailed instructions are preferred and followed. People in high uncertainty avoidance cultures look for structure in their organisations, institutions and relationships to make events interpretable and predictable.

Uncertainty avoidance bias in a society is affected by the degree of individualism or collectivism within that culture. Egalitarians are not inclined to risk taking and score highly on Hofstede's uncertainty avoidance scale. They consider nature to be ephemeral and can therefore only sustain modest demands and needs careful management (Thompson, Ellis and Wildavsky, 1990). Egalitarian ways of life are characterised by strong group boundaries and minimal proscriptions. Strong uncertainty avoidance combined with individualism produces rule based bureaucratic organisations. High

uncertainty avoidance cultures like Germany and France, have a strong quest for the truth demonstrated in the philosophical works of Descartes, Kant, Hegel, Marx, Nietzsche and Sartre. Low uncertainty avoidance cultures produce great empiricists, developing conclusions from observation and experiments, rather than from reflection, like Newton and Darwin in Britain (Hofstede, 1994).

#### ***4.3.2 Individualism***

Individualism is linked to the world view that each person is responsible for their own destiny, and is placed at the opposite end of a bi-polar scale with collectivity by Hofstede (1980). The degree of bias towards individualism is of fundamental importance and is the most frequently identified dimension of cultural bias (Hampden-Turner and Trompenaars, 1993). Individualists are self-seeking, and are not bound by group incorporation nor prescribed roles. Hofstede (1980) found that relative wealth, cold climate, technological development and large organisations, are indicators of a society that places considerable emphasis on the individual. Individualism is highly developed in very simple cultures (eg, hunter-gatherer tribes) and very complex ones (eg America), within nations there is a bias towards individualism is noted in the urban areas (Triandis, 1989). Power, achievement, modernity, technology, wealth and well-developed legal systems are valued in individualistic cultures. Workers feel emotionally detached from their employers and have high job mobility. Social order is placed above community and the nuclear family dominates domestic arrangements. The USA, Britain, Australia, Canada, Holland, New Zealand, Italy and Denmark are strongly biased towards individualism (Hofstede, 1980).

Western views of self centre on the individual body, African and Asian views of self centre on the collective group (Triandis, 1989). Collectivist cultures conform to in-group norms, are respectful, nurturant and intimate. Hofstede (1994) considers that majority of countries in the world are biased towards collectivism, where group interests prevail over individual interests.



Community relations are strong, extended families are common and group decision making is preferred (Hampden-Turner and Trompenaars, 1993). Organisations in collectivist cultures tend to be small, run as a family with strong emotional links, little job mobility, team working and communications are good, and workers spend many years with one organisation.

#### *4.3.3 Hierarchy and Power*

Cross cultural studies commonly focus on the nature of power relations prevalent in societies. Hofstede (1980) studies power from the perspective of the degree to which people can control the behaviours of others in hierarchies (power distance). Hampden-Turner and Trompenaars (1993) link hierarchy with inequality and status. Strong group boundaries and binding proscriptions characterise hierarchical ways of living. Hierarchies are central to the distribution and use of power in society, through which people are controlled by other members of the hierarchy and the demands of socially imposed roles. From a socio-psychological perspective, power can be addictive like a drug, those with power wanting to maintain and increase it for the satisfaction they derive from it (Ng, 1980). Those who feel they have some power want to reduce the power distances between themselves and their superiors.

In high power distance cultures managers are seen as father figures who have absolute power and deserve respect, personalities dominate power positions and status symbols are important. Might prevails over right, scandals involving persons in power are expected, when things go wrong blame is ascribed to those lower down the hierarchy (Hofstede, 1994). Large power distances inhibit the desire for equality and are seen as inevitable by those without power. High power distances prevail in countries with high degrees of inequality and correlate with low economic development, tropical climate and the prevalence of the Roman Catholic faith. Governments tend to be autocratic, coercive, unstable, with charismatic *Machiavellian* leaders. Employees accept inequality, fear to disagree with managers, and are reluctant to trust fellow workers.

Low power distances are found primarily among the middle and upper classes of wealthy, cold and temperate, Protestant countries. All north-west European countries and the USA showed a positive bias to low power distances (Hofstede, 1994). Democratic governments, formal legal systems, technology and education correlate with low power distances. Independence, resistance to close supervision, mixed feelings about management and blame the system attitudes, are characteristic of low power distances. Organisations in low power distance countries, such as the USA and Britain tend to be mechanistic, structured hierarchies. Task and function define hierarchical status, chains of command cascade down hierarchies. Workers feel that they are a separate part of the organisation from management. Workers promoted to supervisory positions are commonly considered to change because power corrupts them.

Hofstede (1994) identifies latitude, population size and wealth as key determinants of power distance. The degree to which climate promotes the use of technology for survival was the prime determining factor of power distance (Hofstede, 1980; 1994). Climate effects lifestyle, concepts of time, architecture, pace of work, diet, appearance, etc. Higher latitudes provide a less abundant natural environment than tropical climates, promoting the need for people to intervene with nature in order to exist and to learn to fend for themselves rather than depend on others (Hofstede, 1994). On the dimension of power distance West Africa was ranked joint 10th with India. Asians and Africans often have a great practical and emotionally problems in understanding the impersonal machine like bureaucracies of western countries (Hofstede, 1994).

#### *4.3.4 Gender*

In addition to climate, bias towards femininity or masculinity within a culture is an important factor. The masculinity/femininity dichotomy is based on the fundamental biological split in the human species. Handy (1985) associates masculinity with ambition, desire to achieve and earn more, and femininity with interpersonal relationships, the environment and sense of service. Masculinity is associated with materialism, achievement, independence,



decisiveness, speed, assertiveness and living to work. Femininity is associated with humanitarian values, personal relationships, small and slow is good, intuition, sympathy, working to live and a sense of interdependence. Austria, Britain, Italy, Germany, Japan, Mexico, Republic of Ireland and Venezuela were all in the top 12 countries on Hofstede's (1980) masculinity index. The cultural bias of masculinity/femininity is not dependent on wealth or climate, however, feminine cultures are somewhat more likely in colder climates, suggesting that there is a need for more equal partnership between men and women to improve the chances of survival in cold climates (Hofstede, 1994). Masculine cultures tend to try to resolve conflicts by fighting; feminine countries by comprise and negotiation. The job enrichment programmes followed by Saab and Volvo are a reflection of the feminine cultural bias of Nordic countries.

#### 4.3.5 Time

There are two ways in which cultures conceptualise time, which the Greeks perceived as two gods - *Kairos* and *Chronos*. Time can be thought of as linear and sequential, moving forward increment by increment (*Chronos*); or synchronous and circular, combining the past present and the future (*Kairos*). Hampden-Turner and Trompenaars (1993) consider Japan, Germany and France display bias to synchronous paradigms, while Britain, Netherlands, Sweden and USA are biased towards sequential paradigms. Sequential managers do one thing at a time, regard time commitments very seriously, see time as a threat and tend to solve conflicts on the first come first served process. Synchronous managers do many things at once, consider time commitments as desirable rather than absolute, and see time as a provider of opportunities. Synchronising managers value open communication, development of human resources and working in teams (Hampden-Turner and Trompenaars, 1993).

American and British culture see time as sequential and therefore as a scarce and precious commodity. Common English and American proverbs attest to the importance of time, eg *time and tide wait for no man*, *time is money*, and

*procrastination is the thief of time.* Without the cultural importance of the concept that time is money there would be no Taylorism and no time and motion studies (Hampden-Turner and Trompenaars, 1993). The negative aspects of this cultural value is the obsession with short-term performance, an unwillingness to take time and invest in the long term. Americans and Northwest Europeans like to get to the point, not wanting to beat about the bush. Many other cultures find this approach rather crude and offensive and do not rush through their days on tight time-schedules (Hampden-Turner and Trompenaars, 1993).

In the so called First World people have experienced a speeding up of human behaviour through technology, eg consuming and travelling. Consequently, time becomes a cost due to the variety of activities that can be undertaken and their perceived opportunity cost; *time is money!* A consistent finding in industrial culture is the attitude that safety is an optional extra that costs time and money as opposed to being part of productive activity. People therefore often view safety measures as costly inconveniences that slow down the job (Bird and Loftus, 1976; Levine *et al.* 1976; Andreissen, 1978; HSC, 1993).

#### **4.3.6 Risk Management**

Westrum (1992), identifies three types of organisational culture based upon way in which they respond to risk. The *pathological* culture is reluctant to deal with risk information, it discourages new information and conceals or punishes failures. The *bureaucratic* culture compartmentalises problems and generally institutes only local repairs. The *generative* culture actively seeks new risk information, rewards messengers, shares responsibility and institute wide ranging reforms. The generative culture corresponds with the factors associated with positive safety cultures. Pidgeon (1992) identifies two approaches to risk management: the *conservative* approach which places emphasis on institutional capacity to set and achieve quantifiable goals; and the *alternative* approach that considers scientific uncertainties limit the capacity for reliable forecasting. The complex and dynamic nature of culture limits the



applicability of technocratic decision making. Pidgeon (1992) considers that risk management resilience comes from a combination of the doctrines of :

- ♦ *absolutionism* - no fault approach to blame to avoid distortion of information;
- ♦ *qualitativism* - consideration given to inherently unquantifiable factors in risk management;
- ♦ *designism* - applying accumulated knowledge to institutional design;
- ♦ *complementaryism* - safety and other goals go hand in hand;
- ♦ *participationism* - emphasis on participative decision making.

The people with power to make decisions within organisations are senior managers and directors at the top of hierarchies. Such people are liable to be individualistic or hierarchial as opposed to sectarian (Douglas and Wildavsky, 1982), cornucopian as opposed to catastrophist (Cotgrove, 1982), high N-ach (McClelland, 1961) type people who are often authoritarian rather than humanistic (McGregor, 1985; Puachant and Mitroff, 1992). Following Gramsci's theory of hegemony cultural meanings are created and frequently imposed by those holding power. The most risky aspects of an organisation may not be physical hazards, but behaviour associated with power and culture (Waring, 1994).

Discussion of risk inevitably brings in socio-political arguments (Douglas and Wildavsky, 1982; Dake, 1992). An individual's processing of risk is just one part of a complex process of the social amplification of risks involving industry, government and the media (Renn, *et al.* 1992). People use their perception of risk in their assessment of the benefits and costs of a particular course of action (HSC, 1993). People with different experiences and different priorities will perceive the same risk differently. The entrepreneur's risk bias is towards the economic gamble of business, their assessment of risk will be different to those of other parties, eg HSE or Greenpeace, because the profit motive is at the centre of their analyses and they may look little further. The entrepreneurial

view of risk is biased towards profit and technology which are key aspects of Eurocentric culture. Within the same society trade unionists, factory managers, lawyers, politicians, engineers, and health and safety inspectors all have different perceptions of the degree of risk inherent in a given situation and the measures necessary to counter them.

#### *4.3.7 International Studies of Safety Culture*

International comparisons of safety culture have tended to be limited to the nuclear industry (Lammers and Hickson, 1979; Fujita, *et al.* 1993; Rochlin and von Meier, 1994; Meshkati, 1995; Rosen, 1995). Rochlin and von Meier (1994), in a study of large PWR nuclear reactors in US and Europe, found that the unique historical, social, and cultural environment has functional and operational consequences. A characteristic of collectively biased cultures is employee involvement, eg suggestion boxes are well used in Japan and Scandinavian countries but not in US and Germany (Lammers and Hickson, 1979). American culture views collectivist behaviour negatively, while Japanese culture views it positively (Fujita, *et al.* 1993). Characteristic biases of the US culture, include: linear engineering paradigms; legalistic; adversarial; and a command and control style of regulation. Rosen (1995) reports significant national variations in the degree of reliance placed on staff to discharge their responsibilities. Based on effective national training programmes, Switzerland, Sweden and Germany place a high degree of confidence on operating staff. In the USA more emphasis is placed on supervision and systems for oversight and review.

Rosen (1995), in a study of twenty nuclear plants, distinguishes three broad culturally different geographical areas; the Far East, the former Soviet Union and Eastern Europe, and Western Europe and North America. In the Far East politeness and respect towards superiors are characteristics of the work culture. Staff are expected to be supportive of their superiors and to work closely as a team. Most notably in Japan, decisions come about only after extensive discussion of alternatives and possible consequences. With these culturally



driven practices, management can easily emphasise each employee's responsibility.

Characteristics of safety culture in the countries of the former Soviet Union and Eastern Europe, include authoritarian management styles and compartmentalisation of activities and responsibilities (Rosen, 1995). This results in a lack of knowledge and curiosity among power plant personnel and a lack of a questioning and self-critical approach. In the former Soviet Union construction and production were emphasised over safety resulting in designs lacking safety features commonly found in Western and Far Eastern plants. Operational safety practices were also weak at Soviet designed plants and severe economic problems limit improvement. The shortage of electricity in some countries results in considerable pressure to maximise production and continue operating plants with safety deficiencies.

Hofstede's dimensions of culture have been used in a cross-cultural study of safety culture in nuclear power plants in Mexico, Puerto Rico and the United States owned by the same US corporation (Meshkati, 1999). The Mexican plant achieved the highest scores of cultural compatibility and safety performance, while the US achieved the lowest scores. They found that even within a multinational corporation with strong efforts devoted to socialisation, national culture plays a major role in influencing attitudes to work, risk, power, time and achievement (Meshkati, 1999). Open communications, procedure following and teamwork is influenced by power distance, collectivism and uncertainty avoidance.

#### **4.4 Summary**

From the cross-cultural studies reviewed the key cultural biases are related to conceptions of risk, gender, power, social relations, and time. Max Weber, in *The Protestant Work Ethic and the Spirit of Capitalism* (1930) examines power, culture and how ideas become global forces in history (Collins, 1986). He identifies Christianity, entrepreneurship, trade, law, land less labour,

ownership and technology as the essential ingredients which promoted the growth of European capitalist culture. McClelland (1961) links the psychological factors derived from, inter-alia, child rearing practices, religious ideals, the absence of slavery and the presence of temperate climates as conducive to the creation of attitudes that were positively correlated with a need for economic achievement. There is an inherent cultural conflict between the positive logic of acquisition and the negative logic of risk avoidance (Beck, 1992).

One of the oldest and most accepted generalisations in safety and decision theory is that people are generally risk adverse and prefer certainty over uncertainty (Douglas and Wildavsky, 1982). A world full of risk adverse people is a figment of the safety specialist's imagination, because risk taking and perception are related to cultural bias. Most societies idolise risk takers, eg sports people, entrepreneurs, prophets, etc. Many people, particularly males, enjoy the trade-off between risk and benefit, ie gambling. Biologically the increased propensity for male risk taking behaviour is a product of elevated levels of testosterone and serotonin (Moir and Moir, 1998). Risk taking is therefore related to both nature and nurture.

The experience of modernisation through industrialisation and urbanisation fundamentally changes cultural relationships. Industrialisation and technology makes social structures increasingly and visibly divisive as new forms of ranking and hierarchy accompanies the division of labour. The culture of modernity imposes identity upon social actors by demanding their identification with particular social institutions and their ideologies of society, proper sexual behaviour, consumption, constructions of risk, etc. Control over nature through technology and hedonistic consumption are central to the culture of modernity in which people are promised a better life through industrialisation, rather than God (Lemert, 1993).

*Faith in progress is the self confidence of modernity in its own technology that has become creativity. The productive forces, along with those who develop and administer them, science and business, have taken the place of God and the church. Beck (1992) p.124*



Risk, uncertainty and responsibility are the discourses which underlie debates about accident causation (Green, 1997). This work specifically examines issues relating to risk perception, cultural identity, production and regulation in the Caribbean and Britain. The next chapter examines literature relating to Caribbean culture.

## *Chapter Five: The Caribbean*

This study examines safety culture in the construction industry in seven Anglophone Caribbean countries, namely: Anguilla, Barbados, Guyana, Jamaica, Saint Lucia, Saint Vincent and the Grenadines and Trinidad and Tobago. With the exception of Guyana, which is part of the South American continent, all the countries studied are island states situated between the equator and 20° north latitude, and 60° and 85° longitude. They have tropical climates with average annual temperatures ranging from between 23° to 28° Centigrade with little seasonal variations except for levels of precipitation and the occurrence of hurricanes. The Region is geologically active with most countries being subject to earthquakes on a regular basis and active volcanoes are present on St. Lucia and St. Vincent.

### **5.1 Country Background**

All the countries studied are former British colonies that used forced slave labour for plantation agriculture. All except Barbados, were occupied by other European nationals, mainly Spanish and French, before British occupation and colonial administration. The most populous countries, Barbados, Guyana, Jamaica and Trinidad and Tobago, secured independence from Britain in the early 1960s. Since independence some countries have established themselves as republics, eg Guyana and Trinidad and Tobago, while others remain crown protectorates. All are currently members of the Commonwealth and all, except Anguilla, are members of the Caribbean Community and Common Market (CARICOM).

All the countries studied, except Guyana, come within the top eighty countries in the world on the Human Development Index which ranks countries' socio-economic standards such as life expectancy, literacy rates, gross domestic product, etc. (United Nations, 1991). Population densities, for the majority of



the islands studied ranged from 215 to 274 per thousand people per square kilometre (km<sup>2</sup>), the principal exception being Barbados (one of the most densely populated countries in the world), with a population density of 599 per thousand people per km<sup>2</sup> (PAHO, 1995). Cancer, heart disease, hypertension, diabetes, AIDS, road traffic accidents and violence are the leading causes of death in the anglophone Caribbean (PAHO, 1995).

Nettleford (1989) emphasises the essential creativity and expressive nature of the people of the Caribbean, which he considers has far more artists than is probably good for it. Music, dance, carnival and the oral tradition are central aspects of Caribbean life. Throughout the Caribbean reggae and soca music constantly reverberates around the bars, buses, clubs, streets and hillsides.

#### *5.1.1 Anguilla*

Anguilla, the most northerly of the Leeward Islands, lies 8km north of St. Martin and 112km north-west of St. Kitts. This low lying coral island has an area of 91km<sup>2</sup> of low scrub and few natural resources except salt deposits (Oxford Interactive Encyclopaedia, 2000). The population numbers around 9000, the majority of whom are of African origin. The main economic activities in Anguilla are tourism, livestock raising, lobster fishing and boat-building (Cameron and Box, 1995).

#### *5.1.2 Barbados*

Barbados is situated 160km to the east of the volcanic island chain of the Lesser Antilles, equally distant between St. Lucia and St. Vincent. It is 34km long and 22km wide, with an area of approximately 430km<sup>2</sup> (Oxford Interactive Encyclopaedia, 2000). With a population of just over a quarter of a million people, it is one of the most densely populated areas in the world. Barbados, unlike the neighbouring islands within the Lesser Antilles chain, is a coral island rather than a volcanic island. The topography is generally one of gentle escarpments rising up towards the east coast, cultivated predominantly with sugar cane.

Barbados, known throughout the Caribbean as *Little England*, had a 300-year uninterrupted connection with Britain (Cameron and Box, 1995). Over 90% of the population of Barbados is of African origin, with other small communities of Europeans and Indians. Barbados is a middle income country with an average GNP of over US\$1.5 million, similar to that of Greece and Portugal (Cameron and Box, 1995). Barbados is the most economically developed of the countries studied, ranked 22nd on the UN's 1991 HDI, and with a GNP per capita of US\$6240 in 1993. The main economic activities include tourism, retailing, manufacturing, financial services, construction and agriculture. The construction industry in Barbados accounted for seven per cent of GDP by economic activity in 1991.

### 5.1.3 Guyana

Guyana, situated on the north east coast of the continent of South America, shares borders with Brazil, Surinam and Venezuela. The country has a land area of approximately 215,000km<sup>2</sup>, equivalent to the size of Great Britain (Cameron and Box, 1995). The country consists of a sparsely populated mountainous inland with plateau grasslands, and the populated flat alluvial coastal belt. The coastal belt, defended by a sea wall to prevent it from flooding, is the main agricultural area and supports 90% of the population. Called *Guiana*, (the land of many waters), by Amerindians, there are four major rivers which provide the main means of transport for people and materials to and from the interior. Guyana has some of the largest areas of virgin rain forest in the world covering over 80% of the land. The Dutch were the first European settlers arriving in the late 16th century and used their knowledge of hydraulic engineering to drain the large coastal plain for plantation agriculture. The Dutch imported African slaves to work their sugar plantations and were renowned throughout the Region for their cruel treatment typified by the act of burning alive mutinous slaves (Daley, 1970).

The population density in Guyana was 3.7 per km<sup>2</sup> in the early nineties, with 70% of the population living in rural areas. Also known as the land of six



peoples, Guyana has a population of approximately 800,000 consisting of Amerindians (5%) and people of African (30%), Indian (50%), Mixed (10%), Chinese, Portuguese and British origin (Cameron and Box, 1995). The major economic activities are sugar, rice, timber and bauxite production, with some gold and diamond mining. The Guyanese economy was in almost constant recession between 1970 and 1990, however after 1991 the economy grew at between six and eight percent per year (Cameron and Box, 1995). Sugar, cultivated on the coastal plain, is the main crop and second highest export earner after gold. The construction industry contributed proportionally less to GDP year on year, as other sectors increased their contributions at a greater rate.

#### *5.1.4 Jamaica*

Jamaica is the third largest island of the Greater Antilles, and is largest of the Anglophone Caribbean islands with a total area of 10,991km<sup>2</sup> (approximately half the size of Wales). The island is 275km long by 80km at the widest point, and is generally mountainous with the highest point being the Blue Mountain Peak (1243m). The Arawaks, the original Jamaicans who named the island *Xaymaca* (meaning the land of wood and water), were wiped out within 100 years of the arrival of the Spanish by the sword, torture, European diseases and working as slaves. The British forced out the Spanish and developed plantation agriculture using African slave labour. Jamaica was under British rule for over 300 years before becoming an independent state in 1962, and remains a part of the Commonwealth (Cameron and Box, 1995).

Over ninety percent of the Jamaican population of 2.5 million is of African origin (Cameron and Box, 1995). The African cultural heritage remains in language, food, dance, religion, attitudes and social arrangements (Alleyne, 1988). The most important areas of the Jamaican economy are tourism, agriculture and bauxite mining. The main agricultural export crops are sugar, bananas, coffee, citrus, cocoa, coconut, pimento, root crops and *ganja* (hemp). Street trading (traders are known locally as *higglers*), small scale farming,

manual trades, suppliers of services and hustling, are key survival activities for many in an economy that has failed to create enough jobs to meet the social needs of the majority (Stone, 1985). The Jamaican economy has, since the mid-eighties, been under the influence of IMF imposed structural adjustment programmes, which drastically reduced Government spending. The construction industry accounted for six percent of employment in Jamaica in 1991 (STATIN, 1991).

#### *5.1.5 Saint Lucia*

St. Lucia, the second largest of the Windward Islands with a land area of 617 km<sup>2</sup>, lies between St Vincent and Martinique. This predominantly mountainous island is volcanically active with sulphurous hot water springs. The French and British fought each other and the Caribs and black-Caribs for control of the island for over 200 years. Today St. Lucia is a member of the Commonwealth, with the British Monarch as Head of State represented by the Governor General. The population of St. Lucia in 1992 numbered approximately 140,000, the majority being of African origin (Cameron and Box, 1995). Despite a century and a half of British colonial cultural hegemony, the French cultural influence is evident in place names, architecture, the predominance of Catholicism, the patois and music.

St. Lucia's economy is dominated by agriculture and tourism. It had the largest banana crop in the Windward Islands in the early nineties, with bananas making up to 70% of the country's total exports. Tourism was a major foreign exchange earner with over 300,000 people visiting the island in 1991, half of who were cruise ship passengers (Cameron and Box, 1995). In 1992 the GNP of St. Lucia was US\$453 million, US\$2,900 per capita. The labour force numbered approximately 60,000 while the unemployment rate averaged around 20% . The construction industry accounted for approximately seven percent of employment in St. Lucia. An oil terminal, deep water harbour and several industrial estates, the largest being in the Vieux Fort area, were constructed as part of the US Caribbean Basin Initiative. Public sector infrastructure



improvement projects included electricity generation and supply schemes, water supply schemes and road construction and improvement projects.

#### *5.1.6 Saint Vincent and the Grenadines*

Saint Vincent and the Grenadines (SVG) consists of the island of St. Vincent and 32 sister islands. The main island of St. Vincent is a green, fertile, mountainous volcanic island with little flat land. It has a total area of 2123 km<sup>2</sup>, with *La Soufriere* the recently active volcano, being the highest peak rising to 1200m. In 1992 the population of SVG was approximately 110,000 with 66% classed as African, 18% as Mixed, six percent as Amerindian, six percent as East Indian and four percent as European (Cameron and Box, 1995). The island is subject to both hurricanes and volcanic activity that can devastate agriculture and tourism, the country's economic mainstays. SVG is a relatively poor country with an annual GDP per capita of around US\$2000. Agriculture dominates the economy of SVG accounting for 20% of GDP (1990), while manufacturing and construction each accounted for an average of nine percent of GDP (Digest of Statistics, 1989). The construction industry in SVG is the third largest employer by industry group, employing almost 4000 workers (Labour Market Information Bulletin, 1990)

#### *5.1.7 Trinidad and Tobago*

The twin island state of Trinidad and Tobago with a land area of 5128 km<sup>2</sup> is situated 11 km off the coast of Venezuela at the most southerly end of the Caribbean island chain. The larger island of Trinidad has three mountain ranges and a central plain. Away from the mountain ranges, most of the land lies below 300m and the central flood plain area is used extensively for sugar cane and rice production. The sister island of Tobago lies 33 km off the north east coast of Trinidad, is smaller (186 km<sup>2</sup>) and consists of gently rolling hills (Cameron and Box, 1995). The population of Trinidad and Tobago in 1992 was approximately 1.25 million people, of whom around 50,000 live in Tobago. The 1.2 million people who inhabit Trinidad make up one of the world's most cosmopolitan populations, with 40% of African origin, 40% of Indian origin,

and the remaining 20% of Syrian, Lebanese, Mixed, South American, European and Chinese origin. The religious faiths, include Catholic, Anglican, Hindu, Muslim, Methodist, Shango and Spiritual Baptist (Cameron and Box, 1995). Trinidad and Tobago rated 39th in the world on the Human Development Index with an adult literacy rate of 96% and life expectancies of 68 years for males and 73 for females (United Nations, 1991).

Trinidad is one of the most industrialised islands in the Caribbean region, with a GNP in 1992 of US\$ 4,995 million (US\$ 3,940 per capita) (Cameron and Box, 1995). Petroleum and its products dominate the economy providing approximately one quarter of gross domestic product, two-thirds of government revenue, and four-fifths of the country's exports. The petroleum industry conducts offshore and onshore oil extraction and has two large oil refineries on the island. Trinidad's dependence on oil has led to great fluctuations in economic activity. During the 1970s the economy experienced rapid growth as oil prices rose and eventual stagnation in the 1980s as oil prices dropped. Tobago is relatively undeveloped with the main economic activities being agriculture, fishing and tourism. Trinidad and Tobago has, like most Caribbean countries, been subject to IMF imposed structural adjustment programmes and debt repayment schedules. State spending and employment levels declined and state run companies were divested. Unemployment rates averaged 20% in the 1980s and early 1990s, hitting the younger age groups particularly. The serious crime rate, much of which is drug related, increased as the recession deepened (Cameron and Box, 1995).

## 5.2 Caribbean Culture

When examining the Caribbean difficulties of definition arise as there is no Caribbean land, only the Caribbean sea; the name *West Indies* is a misnomer given to the Region because of the mistaken ideas of Columbus; there is no common language; and the island chain and a corner of the South American continent is diffuse and diverse. The history of European hegemony distances



Africans and Asians from their countries of origin and their Caribbean neighbours. Economic and industrial development varies almost as much as population density. The countries are heterogeneous in many respects, but share the historical experience of European economic exploitation through plantation agriculture and its associated, but varied racial interaction. Forced migration of millions of African people under slavery and subsequent migrations by other nationalities in search of new economic opportunities, are common themes in all countries. There is commonality in the deep structure of the culture, born from the shared inheritance from Africa, Asia and Europe, and experience of slavery, indentureship, colonialism and the tropical environment. This section explores some of the common aspects of anglophone Caribbean culture, focusing on the African-Caribbean majority.

### *5.2.1 History*

From the time Columbus stumbled across the Region in 1492, bloodshed, exploitation, genocide and cruelty were the hallmarks of European colonialism in the Region. European hegemony in the Region has resulted in the almost total annihilation of the indigenous Amerindian tribes through diseases and slavery. The genocide of the Arawaks has been total, while a only few hundred Caribs survive toady in small, isolated communities in St.Vincent and Dominica. The need for durable cheap labour to work on the growing number of sugar plantations prompted the African slave labour system. The wealth generated by the sugar industry made the countries of the region jewels in the crowns of the major European colonial powers.

The longevity and level of oppression of the African slave labour system varied from country to country. Slavery lasted for over 300 years in Jamaica, but for only 50 years in Trinidad (Lewis, 1983). In Jamaica the planters were brutal in their treatment of African slave labour and lived in constant fear of revolt. Eurocentric attitudes of planters and the colonial governments denigrated the African culture of the majority of the Region's population. Beckford and Witter (1980) describe a system of reculturization employed by planters to control the

slaves. Africans were deliberately separated from their families, tribal groups, and had their cultural symbols and expressions repressed to make them more malleable slaves. The European slave masters deliberately attacked African culture in an effort to change the slaves' culture. They taught slaves that they were *condemned by God to be forever a hewer of wood, a drawer of water and servant to his brother the white man by the curse of Noah upon Canaan*. This cultural adjustment process took between one and three years and resulted in the death of between a quarter and a third of newly imported slaves (Campbell, 1985).

African resistance to slavery took a variety of forms, including sabotage, withdrawal of labour, protest in words and song, escape and outright rebellion (Beckford and Witter, 1980). Resistance to imposed slave labour regimes resulted in the formation of European stereotypes considering Africans as lazy, docile and childlike. Africans deliberately acted dumb and disinterested as a way of beating the system. Europeans did not understand the philosophy of *play fool fe catch the wise* based on the West African folk tales about the crafty and tricky exploits of Anancy the spider (Campbell, 1985).

After the abolition of slavery in 1833 and the end of the apprenticeship scheme in 1838, many African people left the plantations to purchase or squat land to live their own lives and grow their own food. The number of freeholds in Jamaica increased dramatically from 2000 in 1838 to 50,000 in 1861 (Bolland, 1993). The development of a wage labour system in the post-emancipation plantation economy was deliberately limited by the planters importing indentured labour from Portugal, China and India (Rodney, 1981). The majority of the imported labourers came from India under the indentureship schemes operated in Jamaica, Guyana and Trinidad. Workers accepted the arduous conditions and low wages as a way of escaping the hardships of life in India under colonial rule. The colonial system paid little attention to the social well-being of the labouring classes.



The varied colonial histories of Caribbean countries have the consistent features of rebellion against European control and the struggle for freedom and equality for indigenous Amerindians, Africans and Indians who now make up the vast majority of the Region's populations. The culture of the majority of Caribbean people, often termed the sufferers or masses, has been the site of resistance and struggle against de-humanisation under colonialism (Nettleford, 1989). Trade unionism grew prior to the First World War, lobbying for better working conditions and political freedom (Dookhan, 1975). The cumulative effect of education, the media and the reports of friends and relatives returning from living and working abroad, especially in the United States, created a demand for better working conditions. Riots swept through the Region in the 1930s in response to the Great Depression and the hardships it created. Between 1934 and 1938 workers went on strike in Trinidad, St Kitts, St Lucia, Guyana and Jamaica (Garcia, 1973). This unrest led to the Moyne Commission's survey of social conditions in the Caribbean.

The Moyne Commission concluded that the problems of the Caribbean were economic, with widespread unemployment, industrial depression and weak public finances which prevented governments from improving the situation (Dookhan, 1982). This unrest spurred the growth of trade unionism in the Caribbean. The trade union movement became the source of post-colonial political leaders in Jamaica, Barbados, St Lucia and Guyana. Corruption has been rife in political life in the Caribbean. Pantin (1990) gives the examples of Dr Williams (who quoted General Lafayette) *"If I had stolen less the people would have thought me a fool"*, and Bustamante who told a crowd in Trinidad *"People in Jamaica say Busta thief, but if anyone in Jamaica is to thief, is not Busta?"*

Sociologists and anthropologists often describe Caribbean societies as either plural societies or stratified societies, indicating the extent of the perceived social divisions within them. Structuralists following Marxist and Weberian paradigms apply economic criteria to define these societies as stratified by economic class. For Smith (1984), plurality rather than stratification exists,

with ethnic and economic relations producing three distinctly different cultural groups originating in Europe, Africa and India. The British inheritance, particularly the language, continues to have a strong influence on life in the Caribbean, including systems of government, economics and migration. Most legal constraints that operate in daily life in the Caribbean are European, but how life is lived is not (Mintz, 1974). Louise Bennet, one of Jamaica's foremost poets and raconteurs, considers the culture of the African-Caribbean people has an *African beat and European melody*.

### 5.2.2 Caribbean work culture

Any attempt to understand work attitudes in the Caribbean must pay attention to how the work environment and productive processes evolved, including the contribution of the broader social environment (Dobson, 1991). The complex historical interaction of the global economy impacts on the region, effect the work culture of the Caribbean. The lack of work opportunities, absence of unemployment benefit, tradition and necessity all influence notions of work, vocation and leisure. Attitudes to work, management, colour, rank and status combine with the effects of high rates of inflation, currency devaluations and North American hegemony, to produce a unique work culture. The Region has a reputation for high labour costs because of low work level norms that restrict productivity. Caribbean people have an international reputation for being laid back in comparison with those in many other countries.

Nunes (1984) divides labour history in the Caribbean into three periods based on different modes of production which impact on attitudes to work. Between 1640 and 1840 the slavery system brutalised and coerced African people into rigid work regimes producing alienation, fear and negative work attitudes. The post-emancipation period (1840 to 1940) saw the growth of the peasantry characterised by freedom, self-sufficiency, independence and self-employment. People set their own rhythm of work without being watched allowing self-satisfaction, autonomy and fulfilment to replace alienation and coercion



(Nunes, 1984). Since the end of World War Two waged employment has become the norm.

The growth of formal employment and urbanisation shifts the mode of production away from supportive kinship groups to waged employment in factories, offices and shops,. With the growth of formal organisations came their characteristic features: hierarchy, specialisation, routine, control and close supervision. The shift from artisanship to mass production in the industrialisation process took more than 100 years in Europe. The Caribbean experienced a far more intense change in less than a quarter of that time (Nunes, 1984). Throughout the twentieth century employed wage labour has increasingly become the most common life style for African-Caribbeans at home and abroad.

Nunes and Draper (1974) propose a taxonomy of four broad classes of Caribbean business organisations based on ownership and activity, namely Branch Bureaucracy, Margin Gatherer, Public Administration and Indigenous Firm. Branch Bureaucracies are arms of a multinational organisations that are influenced more by world market conditions and developments in the metropolitan countries than by local factors. Profit flows out of the Region, usually from exploitation of primary materials.

Margin Gatherers include commercial importers, wholesalers, distributors and large retailers whose operations are managed locally, but are dependent on external sources of supply. Often originally set up by colonialists or immigrant families, monopolies and cartels are common. The linkages between the owners of these organisations and the political elites helps perpetuate existing social structures (Nunes and Draper, 1974). The civil service in the Caribbean tends to be subject to a high degree of political control being staffed with party supporters, family and friends.

Indigenous firms common in the construction, manufacturing and processing industries have local ownership, workforce and markets, and often have close

links with branch bureaucracies, public administrative bodies and margin gatherers (Nunes and Draper, 1974). It is this sector that is likely to experience the highest degree of development and contribute substantially to the process of social change. All four types of organisation were present in the construction industry of the Region. However, the majority of construction companies included in this study fall into the indigenous firms category. An additional category of Caribbean organisation is becoming increasingly common namely the returning migrant firm. Many Caribbean people are returning from the Britain and US with acquired skills, technology and finance to set up their own businesses in the Caribbean.

#### *Management Styles*

Much has been written on the *Colonial Style of Leadership* that prevailed in the Caribbean prior to independence (Beckford and Witter, 1981; Beckles, 1993). Many of the large family firms that have grown up in the Region have an arrogant management style, which shows scant regard for workers (Lindo, 1991). Workers are often viewed as expendable and replaced rather than developed (Nunes, 1984). Draconian leadership styles, rigid organisational hierarchies and discriminatory employment practices continue in many Caribbean organisations (Dobson, 1991). There is widespread belief among workers in the Caribbean that managers do not work and do not respect workers. Managers commonly consider workers to be undisciplined, lazy, unproductive and unambitious.

#### *Worker Attitudes*

Two detailed studies of employee attitudes, by Carl Stone (1982) in Jamaica, and Gordon Draper (1987) in Trinidad and Tobago, identify a general feeling of distrust between workers and managers. The human relations dimension of worker management relations emerges as the most frequently mentioned area of dissatisfaction with the overall work environment. In Jamaica there was a bitter split between workers and managers in most organisations (Stone, 1982). Draper (1987) also produced evidence of this problem in his survey of workers'



attitudes in Trinidad. In response to questions regarding the most important positive attributes of work, 96% of workers stated that competent supervision was very important, but only 40% said that they actually experienced it in their current work. Promotion prospects, and a sense of feeling of corporate belonging was the next most important positive characteristics of any job. Perhaps more importantly, these factors were also the areas of biggest dissatisfaction with people's current jobs. One of the key socio-cultural factors affecting productivity in Trinidad and Tobago in the early 1980s was the antagonistic relations among management, labour and government (Harvey and Williams, 1991).

Stone (1982) found that 75% of Jamaican workers considered that they were underpaid by between 100 to 200%. Draper (1987) found that 40% of his Trinidadian sample of workers were dissatisfied with their pay. The Region's wage structures often bear no relation to educational qualifications or social importance of the jobs, resulting in negative work attitudes (Nunes, 1984). This was particularly evident in the smaller islands, including St. Lucia, Dominica and St. Vincent, where dock workers for the banana company received relatively high wages for a few hours work per week, compared with teachers and other public servants.

A study of unemployed workers in Jamaica found that many considered hustling to be more rewarding than working for somebody (Buchanan, 1992). Large companies were seen as low-paying exploiters, management as hostile and jobs as insecure. Lieber (1982) describes the attitudes of a fluid collective of male unemployed *liners* (from liming - meaning hanging around with friends) in Trinidad, which included:

- ♦ *living does not mean working for some racist honkey boss for nothing;*
- ♦ *life does not mean sacrificing myself to years of employment;*
- ♦ *I learn more from watching the world go by than digging ditches from dawn till dusk for a few dollars;*

- ♦ *why live if your life is one endless sacrifice?;*
- ♦ *people here love life too much;*
- ♦ *people rather live real poor than get into a jam where they may be in danger;*
- ♦ *people love freedom and do not like being told do it this way;*
- ♦ *you hustle a little, you have got friends and family, you can survive.*

The experience of slavery and the subsequent transition to peasantry and then wage labourer, imparted deeply ingrained negative attitudes to work (Nunes, 1984; Dobson, 1991). Workers often refer to the job as the slave, the employer or supervisor as the slave driver and the time after work as black-man time (Dobson, 1991). The strength of the ideal of independence of the peasant era, allied to the abhorrence of control resulting from the slavery system impact on the Caribbean's industrial work culture (Nunes, 1984). There is an alienation in the Caribbean work culture that often results in workers giving as little of themselves as possible (Coke, 1991). Employers who demand hard work but give bad treatment promote a guerrilla warfare of theft, malingering and sabotage (Robotham, 1992).

### **5.2.3 African-Caribbean culture**

*Emancipate yourselves from mental slavery,  
None but ourselves can free our minds,  
Have no fear of atomic energy,  
Because none of them can stop the times,  
How long shall they kill our prophets,  
While we stand aside and look,  
Some say its just a part of it,  
We've got to for fill the Book.*

Robert Nesta Marley *Redemption Song* Tuff Gong 1980.

Writers on African-Caribbean culture such as Braithwaite (1974), Alleyne (1988) and Warner-Lewis (1990) emphasise the importance of the African cultural inheritance in the Caribbean societies. African inspired religious faiths include Shango, Pocomania, Rastafari and the practice of Obeah. African influenced music styles include Calypso, Mento, Reggae, Soca and Zouk, African dances and drumming styles form part of the repertoires of most of the national dance companies in the Caribbean. Carnival and the steel pan both have their origins



in the African cultural response to European hegemony. The invention of the steel pan in Trinidad followed the introduction of a ban on playing drums by the British colonial government.

Religion is very important to the African-Caribbean population. In Jamaica there are more churches per square mile than anywhere else in the world (Cameron and Box, 1995). Throughout the region people commonly use the phrases *God willing, if it please God*, and *Jah guide* when referring to future events, such as meeting a friend the next day or wishing people well. Dreams are considered to be important messages from ancestral spirits and people are superstitious. For followers of African derived religions, music and worship are inseparable; for orthodox Christians music is an optional embellishment on worship (Alleyne, 1988).

Verbal expression (talk, lyrics, chants, jokes, scandal, etc.) is highly valued in Caribbean culture. Story telling is a Caribbean art practised through drama, poetry, music and general conversation. Spontaneous improvisation and embellishment are highly valued, with obliquity and verbal dexterity respected as a sign of intelligence. Proverbs, sayings and biblical injunctions form an important part of Caribbean verbal communication. Some songs consist solely of biblical or Creole proverbs, strung together in verses including those of Robert Nesta Marley. Reggae artists, such as Burning Spear, Capleton, Culture, Dennis Brown, Jacob Miller, Garnet Silk, Lee "Scratch" Perry, Luciano, Mighty Diamonds, Mutaburuka, Sizzla, Tony Rebel, etc. proclaim the Afrocentric ideologies of Rastafari. Liverpool (1984), Trinidadian teacher and calypsonian (aka Chalkdust), refers to the African tradition of criticism of leaders through songs, resulting in the development of the calypso as a form of protest in the Caribbean.

Calypsonians capture the mood of the people and controversies of the day. In 1992 Fatty Dan won the title of Calypso Queen in St. Vincent's Carnival with a calypso entitled *Don't Do That for Me*. The lyrical content of this song reflects

the general attitude of mistrust of politicians, lawyers, bankers and the police prevalent among the working classes of the Caribbean. A mother pleads with her daughter not to get corrupted by the establishment, citing examples of the scandals of the day. The song advocates honesty and poverty above professionalism and materialism. These attitudes are a reflection of the degree of mistrust that a majority of the working class have towards bureaucracy, politics and the law, collectively known as *Babylon* by Rastafari in the Caribbean.

### *Carnival*

Carnival, which evolved from the combination of African culture and European Catholic pre-Lentern celebrations, is currently perhaps the most noted expression of Caribbean culture that has spread around the world with the Caribbean diaspora. Carnival is the collective creative explosion of *joie de vivre* expressed in music, dance and costume. It is cultural extravaganza of the senses involving music, dance, costume, competition, satire and comedy. Calypsonians (Kaisonians) are the lyrical masters of the season, singing songs of political satire, scandal and *piccong* (hot talk designed to burn like pepper sauce). Steel bands beat out their intricate arrangements on the steel pan, the only new musical instrument invented in the twentieth century. During slavery Carnival allowed slaves from different plantations to mix socially and share a sense of freedom from servitude and oppression. Carnival is common to most of the countries studied in one form or another.

In Trinidad, carnival season starts around Christmas with large fetes (open air parties) where the Soca (Soul/Calypso) songs that will fuel Carnival are first played. As Lent draws near, over the final two days of Carnival, the fetes and competitions heat up to a fever pitch. Revellers *play mas* (masquerade) on the streets and dance away the two days preceding Ash Wednesday. Mas ranges from dirty mas where revellers daub themselves and any others within reach with mud, paint and oil, to the large, spectacular, colourful costume bands such as Wayne Berkley's and Peter Minshall's. Many who take part in Carnival



consider it to bring together their communities and be a psychologically healing activity.

### *Family*

Diverse kinship patterns exist with matriarchies, extended families, and nuclear families all present in the Region. The practices of polygamy and matrilocality, which universally prevail in Africa, are also widely adopted in the Caribbean (Braithwaite, 1974). Price (1988), however, following economic paradigms, attributes matrilocality lower class responses to impoverishment and marginality, and are widespread amongst societies with no experience of slavery or Africa. In the Caribbean the collective extended family predominates, family friends are called uncle and auntie, and the supervision of children is the responsibility of every adult. Alleyne (1988) considers the need to be constantly relating to others, whether by talking, arguing and quarrelling, at the work place, standpipe, or street corner is a manifestation of collective paradigms in Caribbean culture.

### *Political thought*

At the political level, Garveyism, Pan-Africanism and the Black power movement all advocate the dignity of African culture and have strong links with the Caribbean. Pan-Africanists, such as Fanon, Garvey, James, Kwame Ture, Malcom X, Obenga, Rodney and Van Sertima consider that Europe created the Third World and therefore owes an immense debt to its peoples. They regard European affluence and opulence as scandalous because it is derived from slavery and robbery, and demand reparation.

The African psyche continues in the anglophone Caribbean (Addo, 1984). Many African-Caribbean people exist in both the twentieth century technological culture and the ancient spiritual culture of Africa. Many African-Caribbean people follow traditional West African customs and superstitions, including, burying placentas by a tree to give spiritual links between nature and the new born child, passing babies over the coffins of dead

relatives, and celebrating death with a nine-nights ritual (Alleyne, 1988).

Agricultural market systems and co-operative working and finance groups, variously known through the Caribbean as *susu*, *gyap*, *landship*, *pardner*, *waistcoat*, *morning sport*, *la rose*, etc., have West African origins (Braithewaite, 1974; Alleyne, 1988).

The lyrics of Bob Marley, still probably the most famous and influential Caribbean musical artist, describe essential aspects of Afrocentric Caribbean culture, for example:

- ♦ *One love, one heart, lets get together and feel all right (One Love/People Get ready Bob Marley and Curtis Mayfield (1977) Island Records) - oneness brings happiness;*
- ♦ *When the rain fall it don't fall on one man's house .... I and I is flesh and blood. (So many things to say - Bob Marley (1977) Island Records) - people are essentially all the same.*
- ♦ *Aint no rules, no vow, we can do it anyhow, I and I will see you through (Jamming - Bob Marley (1977) Island Records) - little social prescription and a collective, co-operative spirit;*
- ♦ *We all defend the right, Jah Jah children must unite, because life is worth much more than gold; (Jamming - Bob Marley (1977) Island Records) - human relations are more important than material wealth;*
- ♦ *No bullet can stop us now, we neither beg, no we wont bow; neither can we be bought or sold. (Jamming - Bob Marley (1977) Island Records) - resistance, struggle and pride;*
- ♦ *It is a disgrace to see the human race in a rat race (Rat Race on Rebel Music Bob Marley (1986) Island Records) - the capitalist system reduces people to the level of rodents;*
- ♦ *Don't worry about a thing, because every little thing is going to be all right (Three Little Birds, Bob Marley (1980) Island Records) - optimistic view of life.*



Caribbean paradigms consider that work should not be divorced from social activity and that everything must be done with style and with constant gratification (Alleyne, 1988). In traditional African-Caribbean culture, value is placed on life rather than material wealth, typified in the phrase heard throughout the Caribbean "*when your done dead, money is still there*". Many construction workers only work for a few weeks, then stop to enjoy themselves and take it easy for a few weeks. This philosophy of limited accumulation of wealth is of African origin and derives from collective principles which view the pursuit of wealth as an end in itself as offensive (Alleyne, 1988). Factory workers in Jamaica use their African spiritual culture to feel empowerment and to cope with job stresses (Degazon-Johnson, 1994).

### 5.3 Summary

Caribbean countries have small, open, dependent, developing economies, with bloated state bureaucracies and high levels of unemployment and under-employment (Boxill, 1993). Agriculture, fishing, mineral extraction, retailing, music, tourism, light industry and construction are the main economic activities in the Region. The numbers of tourists that annually visit the Region exceeds the local population in the anglophone Caribbean. The smaller islands get overrun with cruise ship tourists several times a week. The sun drenched, palm fringed, white sand beaches; effortless subsistence; carefree dispositions; devotion to sensual pleasures (music, dance, sex); and easy racial intermingling characterise the holiday package image of the Caribbean. However, this perspective ignores diseases of poverty, overcrowding, violent crime and rural disrepair that are part of life for many Caribbean people. On the streets of Caribbean cities many people work struggle to survive outside the formal employment system as higglers, hustlers, handcart drivers, or vendors.

Low levels of trust and productivity in the Caribbean work culture are attributed to poor management (Williams, 1991; Dobson, 1991). Stone (1982) argues that the problem is based in social interaction, leadership and communication, and not with technical or organisational inadequacies in management. Nunes (1984) highlights the impact of social influences upon Caribbean work culture, including patronage and corruption. Boxill (1993) attributes alienation and low productivity in the Region to high levels of unemployment, varying degrees of patronage, the lack of job security and low levels of pay. Economic pressures are exacerbated by the effects cultural hegemony of the Britain and USA, which influence patterns of consumption. Other factors that impact on productivity include the intermittent nature of work due to seasonal influences or dictated by the arrival of imported material and parts; restricted avenues for promotion; relative lack of professional employment opportunities; persistence of colonial attitudes to work and management; and the tropical climate that necessitates regulated work regimes due to the heat and humidity.

The Caribbean was an integral part of the European industrialisation process during the 17th, 18th and 19th centuries (Mintz, 1974). The European slave plantation system was a cruel work system, many sociological and psychological effects of which persist today. Physical violence, negative images of African culture, lack of family ties, external outlook, aversion to physical work have their roots in the experience of slavery. Western cultural influences are commonly valued above indigenous influences, except by those who follow the principles of Afrocentricity, Garveyism, Pan-Africanism and Rastafari (Miller, 1973).

The tropical climate, geological activity, religion and European cultural hegemony influence building design in the Caribbean. European culture influences include roof shapes and styles of ornamentation evident in older buildings and currently in the design of city centre office blocks. In Trinidad and Guyana, Hindu temples are a common features of the architectural



landscape. The traditional chattel house is probably the most common type of dwelling in the Caribbean. In post-emancipation Caribbean history eviction from marginal plantation lands was common. To facilitate their dismantling and relocation, chattel houses are constructed in a modular form, from timber with galvanised metal roofing sheets. They are built upon stone piers above the ground and aligned east to west to allow the cooling Trade Winds to pass through the house. They often have shutters to the windows and hip roofs to resist the forces of passing hurricanes.

This research attempts to examine aspects of the culture of Britain and the Caribbean, with particular reference to occupational health and safety in the construction industry. It examines both the physical and attitudinal aspects of the safety culture of the construction industry in societies that were linked directly by the colonial system and in which commonality exists in terms of language, models of government, and the presence of several internationally operating construction companies. Factors distinguishing Caribbean countries from Britain include: the tropical climate, their relatively small size and low level of industrialisation, populations that are mainly of African origin whose forebears were brought by force by Europeans to work as slaves, and their relatively recent independence from colonial rule. Photograph 5.1, a mural in SVG with the legend *CULTURE: RESPECT DUE*, depicts characteristic aspects of Caribbean culture. It is hypothesized that societal cultural factors produce differences in attitudes, behaviours and environment that impact on safety culture.

Photogrpah 5.1 Mural - Culture: Respect Due  
(painted on the wall of the national stadium in Kingstown, SVG 1992)





## *Chapter Six: The Construction Industry*

This chapter explores the general characteristics of the construction industry which impact on safety culture. Accident causation theories specific to the industry and safety management practices are reviewed. It describes the contribution of the industry to national economies, and characteristic features of construction organisations and the workforce.

Buildings are prerequisites for most forms of social activity. The construction industry plays a vital role in the social and economic development of all countries. One of the earliest cultures to attach great significance to the construction of buildings and monuments were the ancient Egyptians. In a rock tomb of a high official of Thebes who lived some 3,500 years ago, an inscription reads *Let your hands build O people!* (National Geographic, 1995). To build the pyramids, etc. the ancient Egyptians had to mobilise, supervise and feed a huge labour force. The graves of slave labourers demonstrate the fundamentally hazardous nature of construction work, with many corpses having broken or missing limbs. The Japanese nickname their construction industry the "3k industry" referring to Kiken (dangerous) Kitanai (dirty) and Kitsui (difficult) (Larew, *et al.* 1996).

Construction industry statistics are plagued by problems of definition and inaccuracy. Definitions of building and civil engineering operations vary and similar activities occur in a variety of environments. The Standard Industrial Classification (1992) identifies 17 construction activities, including bricklaying, road works, steeple jacks and window cleaning. Employment numbers are inaccurate due to the predominance of informal employment practices within the construction industry, eg, tax evasion, the use of lump labour, and labour only subcontractors are all common. Significant under reporting of nonfatal

accidents plague accident statistics (HSC, 1995). Figures of economic output tend to reflect the state of government expenditure on construction and the state of the economy generally, rather than the intrinsic performance of the construction industry. The prevalence of subcontracting distorts the data relating to construction company size by employment and turnover. The turnover of firms is often undervalued because subcontracted work is excluded.

Research on attitudes, behaviour and safety management in the construction industry has been undertaken by authors such as Levitt, *et al.* (1976), Hinze (1978, 1979, 1981, 1988) and Dedobbeleer, *et al.* (1987, 1989, 1991) in North America, Andriessen (1978) and Laufer (1987) in Holland; Zimolong (1979) in Germany, Mattila, *et al.* (1988, 1991, 1993) and Laitinen and Ruohomaki (1995) in Finland, and Linguard and Rowlinson (1994, 1997) in Hong Kong. Literature searches did not reveal any similar studies having been undertaken in the Caribbean. Few references exist that relate directly to health and safety in the construction industry of the Caribbean. The prototype nature of construction projects, the transient nature of work, low education levels of the work force and high levels of subcontracting contribute to the poor safety record of the construction industry world wide (Rowlinson and Linguard, 1996).

## **6.1 Safety Management in the Construction Industry**

Research on safety management in the construction industry in Britain, includes work by Abeytunga (1978), Dawson *et al.* (1988), Leather (1983, 1987, 1988), Wilson (1989), Whittington, *et al.* (1992), Cooper, *et al.* (1991, 1995) and Jannady (1996). Construction managers often view safety as a cost conflicting with production, take little direct interest in safety, relying on the site supervisor to manage safety, and neglect safety when they feel strong programme and financial pressures (Leather, 1987). Competitive tendering, programme pressures and the use of penalty clauses all set up pressures that conflict with safety management. Time and cost pressures result in risks being ignored and the law being broken with the consent of supervisors and



managers. Workers commonly view safety officers as largely powerless and that safety policies contained good words, but were not the priorities that govern day to day management decisions. Other key factors affecting safety in the construction industry are the lack of provision of safe working conditions, safety training, effective control of site hazards by main contractors, and specific safety responsibilities for managers and workers (Jannady, 1996).

Macho attitudes and a narrow focus on production by management significantly unsafe behaviour (Andriessen, 1978). Workers in the construction industry often find themselves blamed for accidents due to the prevalence of an individualistic blame culture and a simplistic understanding of the causation of accidents. Landeweerd, *et al.* (1990) conclude that the view that construction workers are habitual and ready risk takers is based on false prejudices. Andriessen (1978) in a study of safety behaviour and motivation in the Dutch construction industry, found that safe behaviour is principally motivated by: leadership commitment to safety; positive reactions to safe behaviours; participatory leadership styles; the absence of piece rates; and recognition that safe behaviour does not slow down the job and does prevent accidents. Socio-technical factors including the contracting system, labour insecurity and mobility, construction techniques, excessive workloads, poor co-operation, motivation, attitudes and knowledge are identified as precursors of construction industry accidents by Landeweerd, *et al.* (1990). Personality traits have a limited impact on safe behaviour when compared to the influence of society, organisations, management and colleagues.

The construction industry is labour intensive. Fixed capital stock to output ratios for the construction industry in the Britain are generally less than one, while those for the manufacturing are over three (Ball, 1988). Despite the importance of labour to the construction process little attention is placed on developing people and humanistic management techniques. Meijer and Shaefer (1996) advocate the involvement and empowerment of employees to encourage positive attitudes to safety to reduce the accident toll of the

construction industry. The Bechtel Construction company from the US found that injury rates sharply reduced following the formation of a site joint union and management safety council who set about identifying and removing hazards in the work (Koehn and Surabhi, 1996). Worker participation is enshrined in some country's occupational health and safety law. In both Norway and Taiwan construction companies are legally required to establish safety committees (Koehn, *et al.* 1996). Both America and Canada were pursuing the concept of labour-management committees to be a legal requirement within construction companies (Drysdale, 1995).

At a trination seminar on safety and health in the construction industry, cultural differences in approaches to accidents and safety management were highlighted. The American delegate considered that many accidents are the result of a "get it done" attitude, by equipment malfunctions, and by momentary mental lapses among employees. Worker's compensation costs were the driving force for safety and health in the US construction industry. The Canadian delegate considered the root cause of accidents to be the safety versus productivity paradigm, while the key to success was training supervisors. The Mexican delegate considered that Mexican construction managers see safety and health as an integral part of the work process, but referred to the fact that it is difficult to separate workers from their community standards (Drysdale, 1995).

In a study of 30 construction sites in Botswana, Ngowi and Mothibi (1996) found that in spite of having the same level of basic training, employees of different cultural backgrounds viewed safety procedures differently. Site managers stated that safety gear provided to employees from impoverished backgrounds were often sold and referred to the cultural habits of drinking alcohol or taking herbal drugs. They identified a tendency for workers to travel to work in smart clothes, and as soon as they receive their wages they leave the site to spend their money. Traditional construction techniques, such as the use of mud mixed by hand, proved to be obstacles to get workers to



appreciate the need to wear gloves when working with concrete. Some local cultures were considered to be more emotional or more dominant, causing some difficulties for safety management (Ngowi and Mothibi, 1996).

## 6.2 Construction Accident Causation Models

Leather (1987), Whittington, *et al.* (1992) and Hinze (1996) put forward models of accident causation specific to the construction industry. The focus of these models varies, ranging from the accident victim, to systems of work, to failures across the wider construction process.

### 6.2.1 Potential Accident Subject Model

Leather (1987) modifies the Potential Accident Subject Model (Shimmin, *et al.* 1981) to explain the construction accident causation process. Individual, organisational and job related variables interact in this input/output model (see fig 6.1). On a construction site the potential accident subject (PAS) can be either the victim of an accident or a contributor to one.

**Figure 6.1 Leather's (1997) Potential Accident Subject Model (after Shimmin, *et al.* 1981)**



There is a dynamic interdependence between the psychological (attitudinal and motivational) and structural elements within this model. Internal and external inputs influence the PAS behaviours and attitudes that may or may not result in an accident. The PAS is situated within a social system which includes work mates, managers and external agencies, all of which can influence their safety.

### 6.2.2 Project Management Accident Model

Whittington, *et al.* (1992) propose a model of accident causation for the construction industry based on the detailed investigation of accidents. Their model places more emphasis on failures in project planning and execution, but lacks some of the social dynamism of Leather's model. This model of accident causation illustrates the influence of failures made throughout the construction phase of a project. The model identifies four key areas where failures can occur: company policy, eg, procurement practices; project management, eg, poor scheduling; site management, eg, lack of segregation of works; and by the individual, eg, using an incorrect system of work. Quality management principles and systematic auditing are effective tools to combat these failures.

Figure 6.2 Project Management Accident Model (Whittington, *et al.* 1992)



Ordrazquez, *et al.* (1996) highlight the time dependant relationships between accidents and overall construction project performance. In their study of 17 major civil engineering projects, projects that were over budget experienced



increased accident incidence rates, particularly at the middle and end of the construction phase. Fast-track projects experience more accidents and at an earlier stage of construction, compared to traditional projects which commence construction after most of the design is complete. There are more accidents during times when resources are expended at higher than average rates, and when work rates are increased. Projects that run behind schedule experience and projects with accelerated cost expenditure experience higher accident incidence rates, particularly during the early and middle portions of the construction phase of the work.

### *6.2.3 Distractions Theory*

Hinze's (1996) distractions theory of construction accident causation has a narrower, site based focus, than the social systems approaches of the previous models. Hinze's (1996) model correlates productivity with risk, combining Kerr's adjustment stress theory and goals freedom and alertness theory. Adjustment stress theory predicts that workers under stress have a greater probability of being involved in an accident. Goals freedom and alertness theory postulates that improved safety performance occurs where a psychologically rewarding work environment exists, where workers participate in goal setting and deciding on safe systems of work. The distractions theory has three components namely:

- ♦ the probability of injuring occurring;
- ♦ the probability of achieving a particular work task (productivity); and
- ♦ the mental distractions experienced by workers, including unsafe physical conditions and the extent to which the worker is focused on a distraction.

Hinze's theory is based on the concept that where hazards exist workers will be distracted by them resulting in a high probability of an injury and lower productivity. As the focus shifts from the work to the hazard, productivity declines in proportion to the decline in the probability of an injury. Therefore, safety and productivity are not compatible where hazards exist within the

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work environment. However, safety and productivity are compatible when these hazards are removed, thereby reducing the distractions to workers. For example the provision of a tower scaffold to do work at height, reduces the risk of falls and potential distractions to work productivity. Working from a ladder is neither as productive nor as safe a method of work. Distractions can also take the form of personal life events, such as divorce, celebrations and illness, which can distract workers.

**Figure 6.3 Distractions Model of Construction Accident Causation (Hinze, 1996)**



The distraction's theory helps explain the accident causation in relation to productivity helping managers of construction work to see the imperatives of assuring tasks are performed safely (Hinze, 1996). Physical hazards should never be accepted as part of the work. Managers should always focus on making the work safe first and then focus on productivity.

Construction specific accident causation models range from site specific models which include safety management and personal factors, such as Hinze's (1996) *Distractions Theory*; to functionalist project management models, proposed by Whittington, *et al.* (1992); to wider theories such as Leather's *Potential Accident*



*Subject Model* which includes personal, work and situational influences. All these model offer insights into the specific nature of construction accident propagation. Construction accidents are the result of the interaction of complex socio-technical systems and must be examined holistically in order to identify their root causes.

### 6.3 The British Construction Industry

*The UK construction industry at its best is excellent. Its capability to deliver the most difficult and innovative projects matches that of any other construction industry in the world. Nonetheless, there is deep concern that the industry as a whole is underachieving. It has low profitability and invests too little in capital, research and development and training. Too many of the industry's clients are dissatisfied with its overall performance. .... The industry must provide decent and safe working conditions and improve management and supervisory skills at all levels.* Construction Task Force (1998) p7

The British construction industry, including materials supply and the maintenance of buildings and structures, is a significant sector of the economy, accounting for approximately 10 percent of GDP, 14% of employment and 50% of fixed capital investment (Chartered Institution of Building, 1995). In 1996 the volume of output of the construction sector was divided equally between public and private clients and between new build and refurbishment or maintenance projects (Construction Industry Council, 1997). The industry annually employs around 1<sup>1</sup>/<sub>2</sub> million people and has a financial output of around £50 billion. The major clients for construction work in Britain in 1996 were the government, major retail companies and the privatised utilities. The most common form of organising construction projects was by traditional procurement routes. The British construction industry has an adversarial culture where over 1000 writs are issued each year due to sharp business practices and poor product quality (Latham, 1994; Chartered Institution of Building, 1995).

The state of the construction industry is linked to the economic cycles of recession and expansion. The early and mid-nineties saw a massive contraction of the industry with the loss of around half a million jobs and a reduction in output of over 50% compared with the height of the construction boom of the

late eighties. In 1992 the industry's output was £46.3 billion, accounting for eight percent of GDP. There were around 200,000 contracting firms, half of which were one person firms. Only 12,000 contractors employed more than seven people (Department of Environment, 1995).

The British construction industry has a poor public image (Ball, 1988). The stereotypical image of the construction industry is that it is a dirty, noisy, dangerous, inconveniencing activity under taken by hard living, rude, ignorant, sexist men employed by unscrupulous contractors. Many perceive the industry as a chaotic, hard, violent and dangerous place of work. There is little job security, little training and generally low academic entry requirements to the industry. The pressures of tight work schedules are compounded by bonus payment systems and pay when paid clauses. Sharp practices of many small builders, some of which border on fraud, perpetuate the image of cowboy builders. The images of dishonest and incompetent small contractors persists and is frequently portrayed in television dramas and documentary.

Compared to the rest of British industry, the construction industry is often considered backwards because of its relative lack of use of the latest advances in technology and management thinking. However, this is a linear and narrow viewpoint that fails to take account of the wide variety of enterprises in the industry and the environment in which the industry operates. There are many users of state of the art technology in the construction industry from computer aided design systems, to satellite linked surveying tools and earth pressure balance tunnelling machines. However, the prevalence of contracting to reduce the risk attached to the use of capital within the industry has meant that smaller contractors dominate the industry. These companies have few resources to draw upon and tend to stick with traditional construction techniques.

### *6.3.1 Clients*

Clients are key to the construction process as the initiators, financiers and end users of the industry's products (Latham, 1994). Over the past 40 years the type



of clients who predominate in the British construction industry have changed from the public sector to the private sector. This change has been matched by changing contract terms, reflecting the move away from the need for public accountability to the need for speed of construction. This in turn has led to more short-termism, competitive tendering and agency style contractual arrangements (Atkin, *et al.* 1995).

Government action has profound effects on the construction industry both directly and indirectly. Governments are major clients and can legislate to control the industry. Governments also make decisions that affect investment plans and disposable incomes. During the second world war construction companies were directly controlled by government policy that restricted the business to a few large national, and numerous smaller regional companies. Most of the top twenty construction companies in Britain today, eg, Taylor Woodrow, Costain, Balfour Beatty and John Laing grew through the war and in the post war rebuild.

The financial pressures on all those involved in the construction process are fierce resulting in arguments around apportioning blame and financial liability for errors and delays (Ball, 1988; Latham, 1994). Few clients are delighted with the construction industry's products (Ball, 1988; Construction Task Force, 1998). Construction projects often run over time and cost schedules, do not fully meet user expectations, and often need remedial works due to construction defects. The main issues that arise between clients, consultants and contractors involve finance, time schedules and standards of work. Latham (1993) was disturbed by the impact of professional claims consultants who advise their clients as to how to make money out of the alleged mistakes or shortcomings of other parties and avoid responsibilities. Solicitors are kept busy in the industry drafting and evaluating collateral warranties, specialist contracts and pursuing claims.

Clients seem to have an inherent mistrust of other parties in the construction industry, which must be due in part to the fact that the construction phase of a project takes up typically 85% of the total costs of the development of the project. However, viewed over the lifetime of a building, construction costs represent only a small part of the total lifetime costs of a project. Over a five-year period the initial build costs are typically 37% of total costs, declining to 12% over a 20 year period (Contract Journal, 1995). Most clients demand high speed, high quality work at the lowest cost. Time and financial pressures often mean that the client does not give sufficient time for the preparation of the design. Costs are affected by the standard of workmanship specified, the complexity of the work and the contract conditions. Factors that jeopardise construction quality include:

- ♦ insufficient time;
- ♦ acceptance of the lowest tender;
- ♦ poor specifications;
- ♦ poor contractor management and motivation;
- ♦ insufficient external supervision;
- ♦ inadequate skills and experience.

The use of lowest price competitive tendering and reactive quality control lead to what CIRIA (1991) refer to as the vicious circle of construction procurement (Figure 6.4). Contractors and designers are forced to under-price jobs to get work. Predicted costs are exceeded and cost-cutting exercises are put in place. To cope with the lack of finance, consultants and contractors reduce the quality of work and make claims. The client then institutes more reactive control measures. It is hard for a project to recover from cost-cutting exercises. Contractors hide delays caused by themselves in the hope that delays caused by the client or consultants, may be blamed to avoid liability. This vicious circle of construction procurement is the antithesis of the quality philosophy.



**Figure 6.4 The Vicious Circle of Procurement (CIRIA 1991)**



Traditionally the construction industry is organised so that the architects and engineers design, the contractors build and the clients pay (Latham, 1993). Consultant architects, quantity surveyors and engineers usually work directly for the client and are appointed well before the construction contractor is appointed. Construction contractors are typically appointed after 85% of the design has been completed and have little power to influence the design despite their knowledge of buildability. The continued separation of building design and production is due to the social constraints imposed by the contracting system and the ideology of professions (Ball, 1988). The culture that stresses the importance of vocational merit rather than partnering for quality has prevented designers working more closely with contractors or developers. The evolution of the present-day standard form of building contract was spurred principally by disagreements and compromises between architects and building contractors.

This separation has limited the ability of building contractors to initiate changes in construction techniques as the application of new building technology often depends on their acceptability to designers and only secondarily on their implications for production. This traditional separation of

design and construction has long been a source of controversy in the industry (Abeytunga 1978, Atkin *et al.* 1995). The major government reviews of the construction process, the reports of the Simon Committee (1944), the Banwell Committee (1964), Latham (1994) and the Construction Task Force (1998), all call for closer integration of the design and production functions.

### 6.3.2 *Contractors*

The British construction industry consists of around 200,000 companies ranging from the very small to the very large contractor. Small contractors dominate the industry, 98% employ less than twenty-five people and half of all contractors employ only one person (DoE, 1995). Between 1984 and 1995 the numbers of small construction enterprises (1-7 employees) grew by 21% while medium and large scale enterprises fell by 41% and 35% respectively (Atkin, *et al.* 1995). Growth in the number of small firms in the construction industry creates greater competition, conflict and litigation. As the number of functions and specialisms increased in the construction industry, the scope for confusion over responsibility, attempts to transfer risk, adversarial attitudes and litigation grew (Latham, 1993). In 1992 around 4000 construction companies were liquidated, almost three times 1982 figure.

The largest contractors, who dominate the market in terms of value of contracts won, are sophisticated organisations employing large numbers of highly skilled and well-qualified people. They may be family owned operations or be part of a larger holding company and are often subdivided into decentralised units specialising in particular construction methods or activity, eg, plant hire. Even in the larger contractors, safety management systems are limited to achieving minimal legal compliance and company personnel departments tend to restrict their involvement to giving advice on employment law and industrial relations (Drucker and White, 1995). Smaller contractors who dominate the construction industry, rarely pay attention to formal training qualifications, safety training or site safety induction talks. Informal recruitment practices predominate with workers often gaining work through



friends, in pubs, and by walking onto sites. Site managers hire and fire workers as a project develops resulting in high labour turnover and a lack of loyalty to employers.

Many construction companies are family owned and characterised by tough managers who favour Fordist and Taylorist management techniques based on piece-rates and bonuses (Ball, 1988). Organisations that depend on contract labour, as endemic in the construction industry, are very specific about end results with expectations of quality, quantity, time, payments due, etc., but not the means of achieving them (Handy, 1978). In the construction industry, subcontractors, supervisors and workers often have to sort out how to execute the work. Skills, knowledge, and resources are often limited at this decision making level, reducing the effectiveness of risk management. The one-off nature of most projects, wide use of subcontracting, and lack of worker loyalty, create a challenging environment in which to manage.

Construction activities do not lend themselves to close supervision (Dawson, *et al.* 1988; Latham, 1994). Unlike typical factory work with a stable labour force, finite tasks and a fixed physical environment, in construction even apparently repetitive work like bricklaying or joinery is undertaken in many different environments. The process of management in construction tends to focus on pressuring subcontractors through financial penalties for inadequate performance. Thus there is a tendency for reactive rather than proactive management. Quality management principles view this reactive approach as less effective than taking greater control of the construction process to help to secure performance improvement.

### 6.3.3 Subcontracting

Subcontracting based on specialisation is a fundamental part of the present day construction industry. Few if any construction contractors are able to offer all the specialist skills involved in the modern construction process, so some degree of subcontracting is inevitable. However, it is often employed to transfer responsibility for production and economic risks from the main contractors to subcontractors and results in quality and productivity problems unless a high level of supervision is provided (Abeytunga, 1978). Construction firms, in attempts to increase the flexibility of their capital through subcontracting, have created a greater distance between management, the work and the work force. This creates inefficiencies by increasing the problems of co-ordinating different trades and companies, for example cleanliness may be regarded as everybody's responsibility, but without careful monitoring nobody cleans work areas.

The concern to reduce costs and spread risks promotes increasing use of subcontracting rather than a desire to improve the construction process. The resulting fragmentation of responsibility for production is a recipe for failures in the construction process. Everyone has the incentive to work at speed and poor work can often be hidden with little chance of recrimination. Pushing the line management function down onto subcontractors helped to generate a skills crisis in the industry as smaller contractors often have less ability to train managers and workers (Ball, 1988). As skill shortages worsen, there is a slow, but inevitable, decline in the speed and quality of work. The construction press regularly refer to the fact that skills crises occur when the industry emerges from periods of low demand, because many skilled workers leave the industry in periods of recession. The problem affects contractors, workers and consumers of building products, who suffer higher prices and poor quality. Whittington, *et al.* (1992) consider that the high degree of subcontracting results in:

- ♦ low levels of supervision;



- ♦ poor standards of work;
- ♦ problems with accountability and communication;
- ♦ low provision of facilities;
- ♦ poor risk management;
- ♦ little organisational memory; and
- ♦ low investment in training.

#### *6.3.4 Safety Management*

Management and supervisory attitudes are built upon the importance of the relationship between safety and economic costs and the application of individual care by the operator (Leather and Butler, 1983). The senior line manager on site, regardless of the size of the site itself and the size of the company controlling it, is often considered ultimately responsible for all aspects of the work on site, including health and safety. British site managers commonly consider the primary cause of accidents is worker's stupidity, that accidents are part of life, and there is nothing you can do to stop them (Leather, 1987; Dawson, *et al.* 1988; Whittington, *et al.* 1992). The typical construction manager takes pride in meeting cost and time schedules and is often unwilling to co-operate with safety programmes (Levitt and Samelson, 1987). Marsh (1995) distinguishes between two types of construction manager in Britain: those committed to continuous improvement; and those who are fire fighters. The stereotype of the construction site manager spending too much of their time fighting fires rather than taking the time to plan so that there will be fewer fires to fight, persists. Terms of contract determine the extent to which contractors see themselves as able to provide a safe working environment, while site management's responsibility for safety is commonly passed onto supervisors. The following factors impact negatively on effective safety management:

- ♦ economic recession;

- ♦ lack of commitment to safety policy documents and safety management systems;
- ♦ lack of influence of contractors into design process;
- ♦ perceived conflict of production with safety;
- ♦ pressure of tight programme times;
- ♦ safety issues not considered in design process;
- ♦ unscrupulous tendering for contracts in which the safety items are deliberately excluded on cost grounds; and
- ♦ widespread use of contract penalty clauses and litigation;

Site management use a form of sliding calculus in which they balance their assessment of the risks involved in a particular contravention against the benefits gained from it (Leather, 1985; Dawson, *et al.* 1988). Managers commonly ignore unsafe work practices employed during the completion of urgent work. Managers in the British construction industry operate in an extremely competitive and highly pressured environment. Their reputations and futures depend on the successful completion of the project within the limits set by the contract.

*Given these types of pressures and the enormous variety of tasks they are expected to undertake, it is not unexpected that considerations of health and safety are quite often of marginal significance, except when they directly affect, or are likely to affect, the progress of works. Dawson, et al. (1988) p.110*

### **6.3.5 Front Line Supervisors (Foremen)**

Site supervision on small sites consists of a site agent or supervisor, whereas larger sites may have various supervisors, site agents and managers for different work packages. Most supervisors are appointed because of their experience within the industry, the majority being over 40 years old and having over 20 years experience. Carpenters tend to be promoted to supervisory positions more than any other trade; whether this is due to their practical skills (including accurate measurement), or their frequency and longevity, is not clear. Authors, including: Hinze (1976), Abeytunga (1978),



Andriessen (1978) and Matilla, *et al.* (1994), have investigated the importance of front line supervisors in construction safety management.

On sites where managers reported that their supervisors paid extra attention to new workers had fewer than half as many accidents as sites where the supervisors did not Hinze (1976). Andriessen (1978) and Matilla and Hyodynmaan (1994), emphasise the importance of the front line supervisor in preventing accidents. Supervisors in charge of work groups with the best safety records spent more time on site, had participatory management styles, gave incentives and feedback and made sure standards of housekeeping were good (Mattila and Hyodynmaan, 1994).

British supervisors considered that site hazards were not controlled due to scarcity of resources, poorly defined responsibilities, and a lack of knowledge (Abeytunga, 1978). These factors are exacerbated by fixed price contracts, piece-rates, task overload, crisis management styles, and industry attitudes to risk taking and safety. Safety is considered to be a low priority in comparison with production. The emphasis on speed of production is continuously enforced by the use of piece-rates and the attitudes of senior management. Supervisors commonly consider there to be a fundamental conflict between production and safety, reflected in the conflicting expectations of senior managers and safety advisors. Problems caused by the complexity of subcontractor and sub-subcontractor arrangements are compounded on site by the common lack of definition of authority, responsibility and resources. The safety related knowledge of front line supervisors is often poor. Abeytunga (1978) found that supervisors had poor knowledge of the most common physical, human and systems of work precursors of construction accidents and the methods to remedy them.

### 6.3.6 *The Workforce*

The British construction industry is a male preserve riddled with skill and status divisions (Ball, 1988). There are sharp divisions between professional, managerial, technical and administration staff on the one hand, and the manual trades on the other. The professional and technical groups include architects, engineers, surveyors and other construction professionals including managerial and supervisory staff on site and in head offices. Manual workers include both specialist trades such as electricians, heating and ventilation specialists, carpenters, masons, steel fixers, and general labourers. There has been a move away from traditional craft based skills in Britain, to specialist skills and a decline in the numbers of young people being trained in construction skills (Atkin, *et al.* 1995). While craft based occupations are still widespread, traditional forms of training are being replaced by skills-based accreditation (eg CSCS, NVQ).

British construction site workers are commonly portrayed as hard men, with low academic ability, working long hours for relatively low pay, doing dangerous manual work, in arduous conditions. This is not the case in other countries, Japanese and Korean construction workers enjoy a prestigious position in society while construction workers in the US enjoy high wages. British rates of pay are amongst the lowest in Europe and average working hours the longest hours, yet building costs are the highest (Keeler, 1993). There is an overtime culture where an average construction working week exceeds 45 hours even in periods of recession. Most sectors of the industry work between five and ten hours overtime every week. Working weeks over 50-70 hours are common, particularly in the engineering construction sector. Workers on low pay often demand longer hours to earn a decent wage. Workers on the Thames Barrier Project in the 1980s went on strike due to loss of pay when their shift lengths were reduced from twelve to eight hours (D'Arcy, 1995). Employment in the construction industry is often short term, intermittent and may involve living away from home for months on end.



The harshness and instability of employment in the industry, tight deadlines and bonus schemes force many workers to concentrate on trying to earn reasonable money and keep their job rather than protecting their own safety (Dawson, *et al.* 1985; Leather, 1988). Frequent risk taking, pressure of work, and uncertainty regarding the effectiveness of management are prevalent attitudes amongst British construction workers. Three-quarters of a sample of British construction workers stated that they took risks to get work completed, expressed concerns about the inherent dangers in their jobs and felt that they would endanger fellow workers if they made mistakes (Philips and Cooper, 1995). Eighty percent stated that they had too much to do at any one time and 65% always felt rushed and experienced impossible deadlines. Seventy-five percent believed that productivity targets were in conflict with safety requirements, while 60% considered that they were likely to have an accident. Safety training, whilst considered important, was only rarely put into practice. Eighty-eight percent of workers stated that, despite receiving safety training, rules were disregarded. Half of the sample thought that management did not care about safety, that they would not invest time and money on safety, and thought that the supervisor did not encourage safety (Philips and Cooper, 1995).

Stereotypical images of construction workers view them as hard men dashing around construction sites with devil-may-care attitudes attempting to make the most out of piece-rates and bonuses. Ignoring, or deliberately flouting safety procedures, are natural expressions of the construction worker culture dominated by the widespread use of incentive bonus schemes, the practice of lump working and the inherent danger in certain work methods (Dawson, *et al.* 1985). Safety measures are commonly considered to slow down work, cost money and therefore reduce profits. People trade-off risk against benefits in decision making. This leads to piece rate or bonus systems tempting people to take short cuts. Work related injuries are seen as normal while deliberate breaches of health and safety legislation are justified on the basis that it is invasive and impractical.

Hale and Hale (1972) argue that safety is only one of the forces that motivate worker attitudes and behaviour. The attitudes and behaviours of construction workers are to a large degree the product of their physical, economic and socio-cultural work context (Leather, 1987). Dawson, *et al.* (1985) found that construction workers considered safety officers not to be effective, and that those making decisions in offices did not consider site conditions and made decisions based solely on reducing cost. The concept of individual carelessness as a major cause of accidents is prevalent amongst both workers and management.

### ***6.3.7 Productivity***

Over the past 50 years repeated calls have been made for improved productivity and quality, and fewer defects and lower prices in the British construction industry (Atkin, *et al.* 1995). International comparisons of construction costs show that Britain costs are around 30% more expensive than in France, West Germany, Finland and the USA (Financial Times, 1993; Atkin, *et al.* 1995). This is despite the fact that the wages paid to construction workers in Britain are about half of those in Germany and lower than France or Italy (Construction Industry Council, 1996). There are problems with the definition of productivity, the simplest approach is to compare gross construction output with employment, however, this approach does not take into account the following factors which impact upon productivity:

- ♦ buildability
- ♦ competence;
- ♦ continuity of work sequencing;
- ♦ delays due to materials and equipment shortages;
- ♦ effective work planning;
- ♦ employment conditions and industrial relations;
- ♦ health, safety and welfare provisions;
- ♦ incentives;



- ♦ mechanisation;
- ♦ site supervision;
- ♦ subcontractor interfaces; and
- ♦ working hours and shift patterns;.

The British construction industry is plagued by poor site management, inefficient procurement, a lack of involvement of the contractor in the design process, bad design, and a lack of clear instructions on site (Financial Times, 1993; Atkin, *et al.* 1995). The major causes of delays are shortages of materials and equipment, lack of instructions, sequencing problems, inadequate supervision, congestion and bad weather. These disruptions cause an average loss of productivity of around 25%. Britain's construction industry has one of the worst levels of efficiency and productivity of the major OECD countries, despite boasting some of the lowest labour and material costs. Latham (1994) concluded that the industry could achieve a 30% reduction in costs.

#### 6.3.8 Summary

The construction industry has a low and unreliable rate of profitability which restricts development. It invests little in research and development damaging the industry's ability to adopt new processes and technology. There is a crisis in training with the proportion of trainees in the workforce declining by half since the 1970s and there is increasing concern about skill shortages in the industry (Construction Task Force 1998). The fragmentation of the building process between enterprises involved in contracting, design, materials supply, plant hire and surveying creates conflict, disputes and delays (Latham, 1994). High levels of competition, low profit margins and the prevalence of subcontracting result in contractors under-pricing work to obtain contracts and then putting in contractual claims to make a profit. This environment impacts negatively upon effective safety management and the safety culture of the industry. Safety responsibilities are transferred, avoided or ignored throughout the industry. Training in both task skills and safety is inadequate

across the majority of industry. Conflict, emphasis on production, litigation, skills shortages, time pressures and the view that safety is a cost are antecedents of poor safety management and risk taking.

*if the industry is to achieve its full potential, substantial changes in its culture and structure are ... required to support improvement.* Construction Task Force (1998) p7

The culture the British construction industry is, in the words of a construction manager interviewed by Latham (1993), “*a macho culture which screws the subcontractor and rewards crisis management*”. The Construction Task Force (1998) identify five key drivers of change to set the agenda for improved management of the construction industry at large: committed leadership, a focus on the customer, integrated processes and teams, a quality driven agenda and commitment to people. The Task Force report proposes targets for annual reductions of ten percent in construction costs and 20% in accidents and defects; and improvements of ten per cent in productivity, turnover and profits, and 20% in completing on time and within budget.

Recent changes to the occupational health and safety legislation applicable to the construction industry directed by the European Union have significantly changed the legislative approach to construction health and safety in Britain. The Construction (Design and Management) Regulations 1994 (CDM), represent a quantum leap moving away from specific site based standards to process based goal setting legislation applicable across the industry. Professionals and clients are given specific occupational health and safety duties in relation to the construction process. Competency, resources, co-ordination and co-operation are central themes of CDM. The CDM Regulations help to direct improvement in the safety culture of the British construction industry.



## 6.4 The Caribbean Construction Industry

The construction industry is an important contributor to the economies of most countries. In the Caribbean countries studied, the industry accounted for an average of 15% of employment and ten percent of GDP in the early 1990s. The construction industry's contribution to employment and gross domestic product in the anglophone Caribbean countries varied in relation to country size, economic conditions and development, eg the Jamaican construction industry accounted for seven percent of employment and ten percent of GDP, while in Anguilla it accounted for 30% of employment and 23% of GDP (Table 6.1).

**Table 6.1 Construction Industry Employment Levels and Contributions to Gross Domestic Product (1990)**  
(figures based on data derived from government sources)



The construction industry is an important source of employment and provides the infrastructure for industrial development. The construction process can have a profound effect on local communities in the Caribbean economically and environmentally. The political influence exerted on the construction industry is most visible around election times when numerous minor infra-structural works commence to create a feel good factor by creating local jobs and improving roads, etc. The construction industry is often the site of formal or informal social action programmes. Stone (1985) describes linkages between politics and the construction industry in Jamaica:

*Lacking the economic ability to afford a welfare state Jamaica evolved a system of "welfare politics" using political power to benefit members of the party. These benefits include employment on government projects, contracts to carry out the construction of roads etc., and access to housing and contract labour schemes in the US. Stone (1985) pp.54-55*

There are relatively few studies of the Caribbean construction industry. Westermaas (1977) examines the construction resources within the Region while Suite (1993 a, b), Atherley and Lewis (1992) and Lewis and Mgishawge (1993) describe some of the practical difficulties experienced by the industry including financing, materials and skills procurement and project management. The Department of Civil Engineering at the Saint Augustine campus of the University of the West Indies (UWI) has supervised a number of Diploma and MSc studies into specific aspects the Caribbean construction industry. Subjects studied include the provision of safety equipment and aspects of project management.

Research carried out by the Civil Engineering Department of UWI, includes work by Roberts (1983) on management practices of construction companies in Trinidad, Brown (1982) on productivity and Khan (1985) on management practices and cost effectiveness. Narinesingh (1982) examines some of the direct and indirect costs of accidents and the provision of personal protective equipment by a major Trinidadian construction company. Chin (1978) describes the Trinidadian construction industry as fragmented and prone to material and skilled labour shortages. Chin was instrumental in establishing the Caribbean Uniform Building Code (1985) (CUBIC), adopted as the CARICOM construction code that includes safety items relating inter alia to hot-work, cranes, scaffolds, boilers, access, fire and dust. There were no comprehensive works covering safety in the construction industry of the anglophone Caribbean. The following section provides an overview of the construction industry in each Caribbean country.

#### *6.4.1 Anguilla*

The construction industry in Anguilla was the second largest contributor to the gross domestic product behind hotels and restaurants accounting for 20% of gross domestic product at factor cost in 1991. The industry was declining in activity due to the slowdown in new hotel development. The construction industry was the third largest employment sector in Anguilla behind the



wholesale and retail trade, and community and social services. The construction industry employed a total of 754 people in 1991 (14 of whom were women) accounting for 31% of male employment. Sixty percent of these workers were employed by the private sector, 37% were self-employed and 3.6 percent were employed in the public sector by the Ministry of Works, who retained a small road maintenance crew (Statistical Unit, 1992).

#### *6.4.2 Barbados*

The construction industry in Barbados in 1992 was in a state of decline, with little activity in either the private or public sectors. Employment figures dropped by 20% in the construction industry between 1989 and 1991 falling from 11,000 to 8,000 (Sawes, 1991). However, between 1987 and 1991 the construction industry was the fifth largest employer accounting for between eight and ten percent of employment. The government's capital works programme was drastically reduced in the late eighties and early nineties resulting in the suspension of work on two large projects, a school and the National Exhibition Centre.

#### *6.4.3 Guyana*

The construction industry in Guyana, between 1988 and 1993, experienced a period of decline, its contribution to GDP halving from seven percent to three-and-half percent. The construction industry was contributing less and less to the gross domestic product of the country as the other sectors expanded at greater rates. In 1991 the construction industry employed approximately three percent of Guyanese workers. Timber was commonly used in both the construction process and in built structures due to the expanses of rain forest in Guyana.

#### *6.4.4 Jamaica*

The construction industry in Jamaica accounted for around ten percent of GDP in 1991, an increase of two percent from the 1986 level (Economic and Social Survey of Jamaica, 1991). It accounted for 6.4% of employment in 1991 with an

average total of 58,200 workers out of an estimated total labour force of 907,700. The Government was not a major employer of construction workers, but was an important client. The private sector started 1,664 residential units during 1991, representing a 77% increase over the number of starts recorded in 1990. The majority of this increase was due to the Greater Portmore Housing Project, financed in part by funds from the San Jose Accord and the Commonwealth Development Corporation. The government has a 51% share in one of Jamaica's largest construction companies, Astrom, through a long-standing agreement with an Israeli Company.

#### *6.4.5 St Lucia*

The construction industry in St Lucia in 1991 accounted for approximately eight percent of GDP at factor cost (EC\$56 million) compared with six percent in 1985 (EC\$32 million) (Annual Statistical Digest, 1991). The construction industry experienced a decrease in activity in 1990 with a drop of a third in the floor area and value of plans approved. The number of employed persons in the construction industry was 4,500 in 1991, of whom over 97% were male workers accounting for 16% of male employment in St Lucia (Population Census, 1991). The Ministry of Works in St Lucia only employed small teams of tradesmen to carry out minor works to government buildings. The number of employers registered with the NIS ranged between 43 in 1986 and 76 in 1991.

#### *6.4.6 Saint Vincent and the Grenadines (SVG)*

SVG is one of the least developed Caribbean countries, there is little large-scale industry and with no large urban centres 75% of the population is classed as rural. The construction industry in SVG accounted for nine percent of GDP (at factor cost) between the second half of the 1980s, averaging EC\$13 million per year. The government directly employed few construction workers but had an important effect on the construction industry in financing major infrastructure improvement projects such as the road improvement project. The Ministry of Communication and Works employed approximately 200 people in the repair



of government buildings. Average daily earnings for construction workers in SVG were around EC\$24 per day (£5), EC\$4 above the minimum wage.

#### *6.4.7 Trinidad and Tobago*

Following the 1982 OPEC oil price agreements, the construction industry in Trinidad and Tobago went into decline along with the rest of the economy. Between 1981 and 1992 the number of approved building plans fell by 37% from 3,423 to 1,251, while the floor areas of the plans approved almost halved (Central Statistical Office, 1995a). This decline in the number of plans approved for buildings matches a similar decline of almost 50% in the number of large construction companies registered with the National Insurance Scheme (NIS). In 1992 the construction industry of Trinidad and Tobago accounted for nine percent of the gross domestic product, 15% of the labour force, 11% of employment and 35% of unemployment (Central Statistical Office, 1995b). The construction industry accounted for 20% of the male and seven percent of the female labour force. In 1992 there were 38,000 paid employees in the industry, of whom approximately 23,000 were government employees and 15,000 worked in the private sector. Seventy-five percent of construction workers worked between 33-40 hours per week, and of these, 70% were aged between 25 and 49 (Central Statistical Office, 1995b). Only 4000 workers in the construction industry were classified as self-employed.

The Trinbagonian government was a major employer of construction workers employing approximately half of the total labour force in the construction sector between 1987 and 1990. The Ministry of Works employed approximately 2,500 construction workers on a permanent basis and up to 18,000 people on its Labour Intensive Development Programme (LIDP). The LIDP intended to offer three periods of work of two weeks duration every year to as large a number of people as possible. Most jobs involve the maintenance and repair of government buildings, roads and some small scale building projects. Major works and internationally funded development projects are put out to tender to private contractors.

## **6.5 Comparison of Accident and Ill-health Statistics**

The construction industry is globally renowned for its informal employment practices and operations. In the 1990s the Labour Force Survey of Britain estimated that 60% of nonfatal reportable accidents in the construction industry go unreported to the HSE (HSC, 1995). The dubious accuracy of particularly nonfatal accident data, limits the extent to which meaningful comparisons can be made. However, available data suggest that there is significant underreporting of industrial accidents and cases of ill-health under the relevant industrial health and safety legislation in both Britain and the Caribbean.

### **6.5.1 Britain**

On the basis of reported accident data, the British construction industry is more dangerous than any other land-based industrial activity except for mining. Between 1986/7 and 1991/2, 851 fatalities occurred in the construction industry. On average five workers were killed every fortnight and a member of the public was killed every month (HSE, 1994). The rate of fatalities in the construction industry was six times greater than that in the manufacturing sector and nearly 16 times the rate in the service sector. In the mid-1990s the annual accident toll from the construction industry included around 85 fatalities, 3000 major injuries and 11,000 over three-day accidents every year (HSC, 1995). With an estimated 60% under-reporting of non-fatal construction accidents, the actual number of major and over three-day injuries is likely to be 6000 and 22,000 per year respectively for all construction workers. British figures exclude road traffic accidents, which are a significant cause of fatal accidents to construction workers and are included in the statistics of many countries, eg, USA, France, Denmark.

Falls from height account for around half of all fatal construction industry injuries to workers in Britain, the majority of which result from falling through fragile roof lights. Other common causes of fatalities include trapping, collapsing or overturning accidents (14%), being struck by a moving vehicle (14%) and being struck by a moving or falling object (9%). Roofing, ground



works and demolition are the activities that produce the most fatal accidents. Inadequate training or instruction, and inadequate supervision each contributed to around 100 deaths between 1986/87 and 1991/92 (HSE, 1994). Compared with other workers, British construction workers' experience increased mortality rates from malignant diseases particularly lung cancer and stomach cancer, as well as from work-related accidents. These result from exposures to hazardous substances and physical agents of harm at work, and poor diet, excessive alcohol consumption, smoking, and stress induced by living away from home (Dong, *et al.* 1995). The number of cases of ill health caused by the industry is difficult to gauge accurately. HSE (1994) estimates that annually:

- ♦ up to 48,000 suffer from musco-skeletal problems;
- ♦ up to 23,000 suffer respiratory diseases;
- ♦ up to 10,000 suffer from dermatitis; and
- ♦ almost 6000 workers suffer occupational deafness.

Asbestos-related diseases were estimated to kill between 3000 and 3500 people every year in Britain during the 1990s. This figure is likely to go on rising, probably for the next 25 years, when the death rate could be between 5000 and 10,000 each year (HSE, 1994). The long latency of asbestos-related diseases (those for cancers and mesothelioma are anything from 15 to 60 years) means that these deaths are occurring from exposures that have already taken place. Construction workers such as carpenters, electricians, plumbers, gas fitters and cabling installers form the largest high-risk group. This is because of the common use of asbestos materials in buildings in Britain for insulation and fire protection from the start of the 20th century.

### *6.5.2 The Caribbean*

In the Caribbean there is no standard method of collecting and recording occupational accident and ill-health data. In most of the countries studied limited industrial accident and ill-health data were available from both Labour Departments and the National Insurance Scheme (NIS). However, Anguilla did not collect any occupational accident data, and in Saint Lucia data were only available from the NIS. There were often large differences between the two sets of data available from labour departments and the NIS, due to differing reporting requirements, the wider coverage and beneficial aspects of reporting to the NIS.

The definition of what constitutes a reportable work accident differs between countries within the Caribbean Region. In Guyana, employers are legally required to report all one-day absences from work both by the NIS and occupational health and safety legislation. In Jamaica the Factories Act 1943 requires the submission of reports of all incidents resulting in over 48-hour absences from work. Barbados, Saint Vincent and the Grenadines, and Trinidad and Tobago require reports of greater than three-day absences from work caused by occupational accidents. There was little information available concerning occupational diseases throughout the Region. Appendix 1 contains tables detailing the available relevant Caribbean occupational accident data.

### *6.5.3 Fatal Accident Incidence Rates*

In 1990/91 the fatal accident incidence rate for employees in the British construction industry was 9.3, while the all industry rate was 1.6 (HSE, 1993). Averaging the Caribbean fatal accident incidence rates gives a regional value of 1.7 for the construction industry and 0.23 for all industry in 1990, (estimated working population of the construction industry in the Caribbean countries studied is 125,000) (Table 6.2).



Table 6.2 Fatal Accident Incidence Rates by Country

COUNTRY	DATE	ALL INDUSTRY		CONSTRUCTION INDUSTRY		NOTES
		No	Rate per 100,000	No	Rate per 100,000	
Anguilla	1989	-	-	-	-	No industrial accident data available. Oral-evidence stated no fatalities had occurred
	1990	-	-	-	-	
	1991	-	-	-	-	
Barbados	1989	2	1.9	1	10.75	Figures from Labour Department
	1990	0	0	0	0	
	1991	2	2.17	1	11.76	
Guyana	1989	12	2.64	0	0	Figures from the NIS annual reports, death figures include shooting, stabbing, road traffic accidents. etc.
	1990	17	3.74	1	1.6	
	1991	10	2.2	0	0	
Jamaica	1989	0	0	0	0	None reported to Ministry of Labour no details available from NIS
	1990	0	0	0	0	
	1991	0	0	0	0	
St. Lucia	1989	1	4.37	0	0	National Insurance Scheme Figures
	1990	2	7.94	0	0	
	1991	3	10.26	0	0	
St. Vincent	1989	0	0	0	0	Labour Mkt Bulletin Vol 3 1990 (same fatality)
	1990	0	0	0	0	
	1991	1	2.6	1	30	
Trinidad and Tobago	1989	5	1.4	0	0	Central Statistical Office Reports
	1990	2	0.5	0	0	
	1991	4	1	0	0	
Britain	1988/89	529	2.4	109	9.9	HSE Annual Reports. Employees only RIDDOR Reports
	1989/90	370	1.7	108	9.4	
	1990/91	346	1.6	110	9.3	

The variation in rates caused by one fatality in small population size samples is demonstrated in the examples of the construction industry fatal accident rate for Barbados (12) and Saint Vincent (30), in 1991. Two fatal accidents were recorded in the Caribbean construction industry in 1991, giving a fatal accident incidence rate of 1.6. This may be compared with the British fatal accident incidence rate of 9.3 for the construction industry in the same year (see Appendix 1 for further details).

The fatal accident incident rates for individual Caribbean countries were often higher than British rates, due in part, to the use of NIS figures whose classifications of fatal accidents included road traffic accidents and acts of violence, the wider scope of the application of the NIS, and the small sizes of

the working populations. All accident incidence rates for the Caribbean construction industry are less than a tenth of those for Britain (140 v 1876).

#### 6.5.4 Non-Fatal Accident Rates

Table 6.3 Non-Fatal Accident Numbers and Incidence Rates by country

COUNTRY	DATE	ALL INDUSTRY		CONSTRUCTION INDUSTRY		NOTES
		Number	Incidence rate	Number	Incidence rate	
Anguilla	1989	-	-	-	-	No industrial accident data available.
	1990	-	-	-	-	
	1991	-	-	-	-	
Barbados	1989	1120	1076	70	642	Figures from Labour Department (> 3 day). Employment figures Labour Market Information Report 1990
	1990	959	913	22	230	
	1991	812	801	27	318	
Guyana	1989	2992	1108	15	165	Assumes 9,000 construction workers. Reports for greater than one day absences. NIS figures. Total workforce 270,000
	1990	3350	1240	11	121	
	1991	3774	1397	13	143	
Jamaica	1989	2363	473	68	224	Greater than two day absences. Figures from NIS assumed 30,000 construction workers
	1990	2133	427	40	152	
	1991	3477	695	126	405	
St. Lucia	1989	130	516	-	-	From National Insurance Figures, not recorded by industry group. (> 3 day)
	1990	159	592	-	-	
	1991	166	568	36	1663	
St. Vincent	1989	29	77	23	675	Labour Mkt Bulletin Vol 3 1990, (> 3 day) Total employees = 37,782 construction workers = 3,380
	1990	32	85	19	557	
	1991	18	48	15	440	
Trinidad and Tobago	1989	695	190	2	5.2	CSO Reports Trinidad Labour Dept. Figures. (> three day absences.)
	1990	748	200	1	2.5	
	1991	699	174	0	0	
Britain	1988/89	174559	785.3	18763	1842.9	HSE Annual Reports. Employees only RIDDOR Reports
	1989/90	181928	811.5	20339	1971.4	
	1990/91	176537	797.6	19377	1876.5	

The all-industry accident incidence rate in the British construction industry in 1991/92 was 1870.6 while the all industry rate was 797.6. In 1992/93 the all-reported injury rate was 739.5 for all British industry and 1602.8 for the construction industry. The all-reported injury incidence rates of the Caribbean nations studied were generally lower, with the exceptions of Barbados and Guyana. The all accident incidence rates for the Caribbean construction industry were generally less than 50% of British figure.



Construction specific data is often difficult to obtain and is plagued by underreporting. Occupational accident and ill-health data is often sparse and sometimes absent in the Caribbean. From the available data construction accidents occur more frequently in Britain compared with the Caribbean. Electrical, 'struck by' and machinery accidents appear to be more common causes of fatal accidents than falls, in contrast to Britain.

## 6.6 Summary

Worker bravado and risk taking is often cited as the cause of the high level of accidents in the British construction industry. An alternative explanation is that management fail to control risks and give workers strong incentives to work fast, which encourages them to dispense with safety precautions. Aspects of both these explanations are valid but must be considered in conjunction with the physical risks inherent in the industry, the economic factors that affect the industry and in the wider context of societal culture. Accidents and poor working conditions are not inevitable consequences of building work, but reflect problems with the organisation and execution of construction projects.

The characteristics of the construction industry in Britain and the Caribbean have a number of similarities and differences in construction process, management, regulation and risk. From the literature review both cultures are characterised by ineffective management styles, subcontracting and fragmentation. Societal culture has a significant impact upon industrial safety culture. Characteristic differences include the British bias towards tight time schedules, competition, litigation and conflict. Accident data indicates that there are fewer construction accidents in the Caribbean construction industry compared with Britain. This study sets out to explore the factors which may account for this. The following chapter presents the methodology used to collect data to examine the key characteristics of the safety cultures of the Caribbean and British construction industry.

## *Chapter Seven: Methodology*

This chapter describes the methods used to conduct this analysis of safety culture. It describes the conceptual model of safety culture which forms the basis of this work, traces its origins and justifies its use. It summarises the methods used to collect data, and details the attitude scales, interview schedules and auditing tools used in this study. It provides an overview of the specific work undertaken during this research.

### **7.1 Rationale**

Safety as a discipline has followed on the heels of technological development and has centred upon the scientism of engineering, scientific management techniques and rational law. It is, however, intimately linked to the fuzzy concepts of risk and social action. The examination of safety culture must therefore pay due regard to sociological and psychological theory. A combination of psychological and ethnographic methods are appropriate tools for understanding safety culture (Schein, 1990; Guest, *et al.* 1994). This study collects data using audits, attitude surveys, and ethnographic techniques to provide a holistic cultural analysis of safety in the construction industry.

Sociology is concerned with social acts produced outside the individual by collective action (Haralambos and Holborn, 1990). The positivist approach to sociology of Comte and Durkheim places emphasis on the scientific collection of data and statistical analyses to determine causal factors. It is, however, prone to cultural bias because it only describes what it sets out to measure following scientific paradigms. Cultural studies have been plagued by the cultural bias of the researchers, because of ethnocentrism (Park, 1950). People tend to look at life through their culturally fabricated lenses (Douglas and Wildavsky, 1982). The deductive approach, advocated by Popper amongst

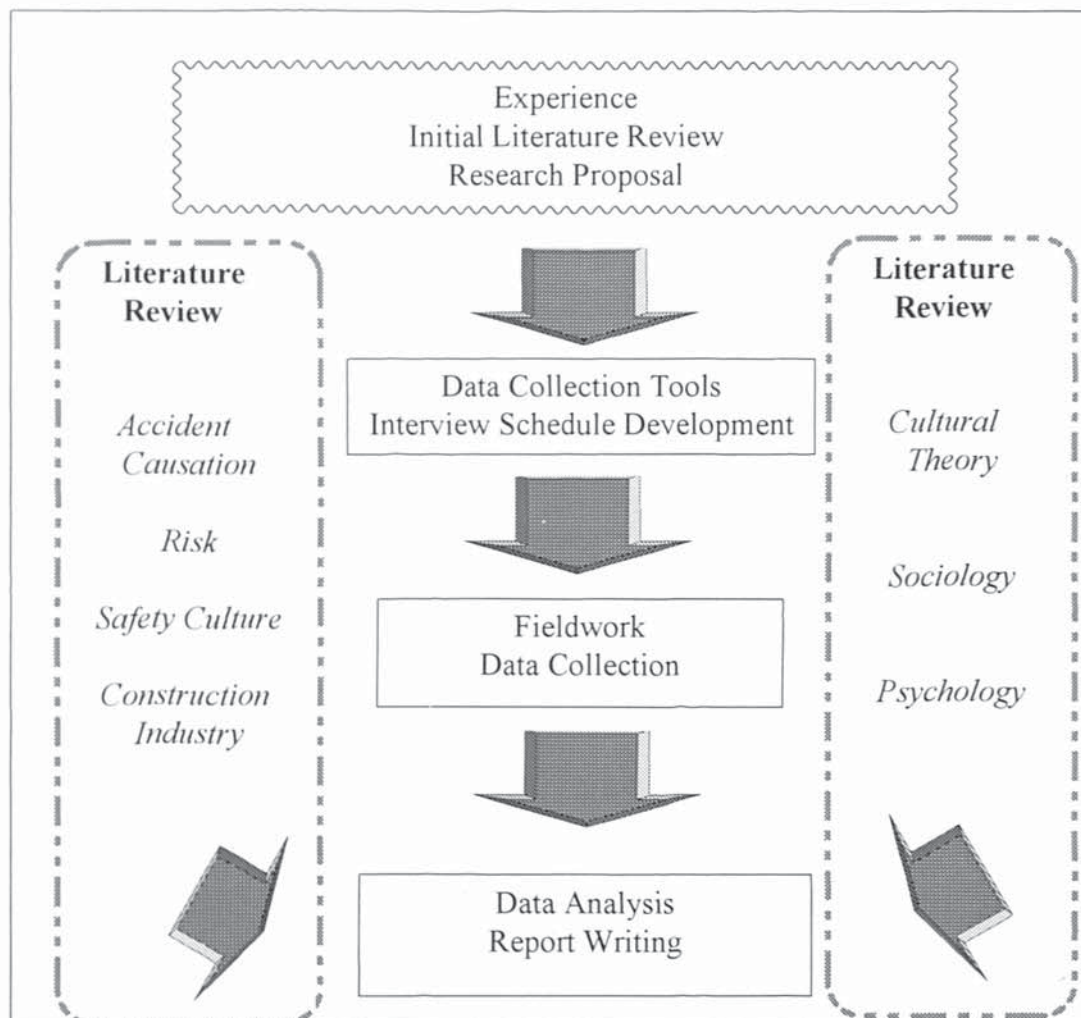


others, starts by hypothesis formulation and testing as opposed to data analyses and theory formulation. This comparative study uses both quantitative and qualitative data, for the deductive testing of the hypothesis that:

*The safety related attitudes, values, behaviours and situations of actors in the same industrial activity in different societies, will have similarities and differences which define their respective safety cultures.*

This research took place during the 1990s, on a part time basis, following the Research Process Map (Figure 7.1).

Figure 7.1 Research Process Map



Initial practical experience in construction health and safety and knowledge of the Caribbean prompted further investigation. An initial research proposal elicited positive responses, leading to more detailed investigations and the

formulation of a research plan. Relevant research and data collection tools were identified. Fieldwork was undertaken in the Caribbean between 1992 and 1994, and in Britain between 1995 and 1996. Data analysis, further literature review and report writing followed the completion of the fieldwork.

## **7.2 Analysis of Safety Culture**

Bandura's (1977) reciprocally determined social cognitive model of human behaviour is frequently cited in the safety culture literature (Cooper, 1993; Geller, 1994; Cooper and Philips, 1995; Cameron, 1997; Cooper, 1998).

Bandura's Theory of Social Learning is based on a reciprocal triadic model in which the situation people find themselves in will influence both their behaviour and their attitudes. People's behaviour will influence both their attitudes and their situation, and people's attitudes will influence their behaviour and the situation. Human behaviour is motivated and regulated by biological necessity, the ongoing exercise of self-influence and by external sources of influence (Bandura, 1991). Bandura's (1977) triadic model of social learning provides a framework for cultural studies which promotes holistic and objective analysis.

Cooper (1993) developed Bandura's model into a reciprocally determined triadic model of safety culture with safety climate, safety management systems and safety behaviours as the three points of the triangle (Cooper and Phillips, 1995). The focus of this model can be extended away from the organisational level to the industry level. Cooper's (1993) model is revised in this study by placing safety climate and safety management within the triadic framework of cognition, behaviour and situation (Figure 7.3). Behavioural factors include team working and violations, cognitive factors include locus of control and values, situational factors include both internal (eg, housekeeping) and external (eg, legislation) factors. These factors interact and influence each other in this reciprocal model of safety culture.



**Figure 7.3 Social Cognitive Model of Safety Culture** (after Bandura, 1977, 1986 and Cooper and Phillips, 1995)



The specific cognitive, behavioural and situational factors highlighted in the model are derived from the findings of the safety culture literature survey detailed in Chapter four. Safety climate refers to the cognitive aspects of safety culture which are influenced by, and in turn influence, behaviours and situations. Safety management systems have cognitive, behavioural and situational aspects. The reciprocal nature of this model reflects the dynamic, complex and chaotic nature of safety culture. The model can be used to examine the key influences on safety culture at each point of the triangle, and at any specific level (individual, group, organisation, society) of a socio-cultural system. This model recognises that the strength of each element may be different in any given situation. Describing a safety culture as good/positive or poor/negative equates with the possession of characteristics identified as being

effective or ineffective for controlling occupational risks to health and safety in their operating environment.

An organisation's safety management system, the prevailing safety climate and daily goal directed safety behaviour can be evaluated making it possible to assess safety culture in a meaningful way (Cameron, 1997). Attitudes can be measured using a safety climate tool and explored during interviews.

Behaviours and situational factors can be assessed by a variety of techniques including audit, literature review, direct observation and questioning. The triangulation of different information sources provides a check against observer bias and provides verification of the emergent conclusions (Bryman, 1988).

To assess the safety culture of the construction industry within Britain and the Caribbean, it was necessary to identify and formulate behavioural, situational and attitudinal measures applicable to both cultures. This involved both the identification of suitable measures formulated by previous researchers and the production of original interview schedules. The measures used in this study are designed to assess site safety standards, organisational arrangements, work setting and experience, legal environment, workplace risk, and attitudes towards management, fellow workers and site conditions. This study employed three out of the four sociological observational techniques detailed by Gold (1958), namely:

- ♦ *complete observer*: information was gathered by direct observation of items included in the safety audit, and generally during site visits .
- ♦ *participant as observer*: observations made whilst working as a factory inspector specialising in the construction industry in both Britain and the Caribbean.
- ♦ *observer as participant*: interview schedules and attitude scales were used to conduct focused interviews with both individuals and groups.



Only the technique of *complete participant*, where the researcher conceals his purpose from his subjects whose group he attempts to join, was not utilised. The focused interview technique allowed freedom of response and the collection of the views of interviewees towards a semi-structured question set. The combination of data sources, ie audit, interview schedules, attitude scales, observations and official data provides both qualitative and quantitative data which can be cross-referenced to ensure the validity of the findings.

The main focus of this research is the examination of safety culture in the Caribbean construction industry and to compare and contrast it with the safety culture of the British construction industry. A holistic view of culture directs the study of the physical, sociological and psychological factors which define the cultures under study. Behavioural and environmental determinants studied include organisational safety management related behaviours and situations that influence safety standards on site. Psychological aspects studied include attitudes to safety of various actors involved in the construction industry and the values expressed in Caribbean culture. The following specific objectives were set for this study:

- 1) assess standards of construction site safety in the anglophone Caribbean and in Britain;
- 2) assess construction worker attitudes to health and safety related issues in the two regions;
- 3) examine health and safety management practices of construction companies in the two regions;
- 4) identify the societal factors which impact upon the safety culture of construction sites in Britain and in the Caribbean, including law, tripartism and societal values.

### 7.3 Tools for Data Collection

The physical products of human behaviour which make up constituent parts of the safety culture of the construction industry include the physical conditions and behaviours found on sites, the management practices employed by organisations, and the scope and enforcement of health and safety legislation. Attitude scales facilitated the structured collection and scaling of construction workers' attitudes and allowed the comparison of safety climates in the construction industry of the two regions. Site safety auditing, discussions of safety management techniques and the review of legislation and enforcement practices were carried out to collect information on behavioural aspects of safety culture.

#### 7.3.1 Site Safety Audit Tool

A construction site safety audit tool was developed and validated by Cooper, *et al.* (1991). Their *Construction Site Safety Performance Audit* was developed by identifying situations and behaviours which commonly result in accidents in the British construction industry from literature reviews, accident data analyses and personal interviews. The audit items relate to behaviours and situations identified as the most likely precursors of accidents according to both accident statistics and the results of a survey of the opinions of safety professionals within the industry (A2.1.1 - Appendix 2). Following Reber and Wallin (1984) and Sulzer-Azaroff (1987), these situations and behaviours were evaluated, rated and validated prior to selection and use in the final audit. The audit system items focus on discrete situations and behaviours commonly found during construction work in Britain.

In developing this measure, over 200 hundred situations and behaviours were identified which contribute to the causation of accidents in the British construction industry. Twenty-four items were selected after a ranking exercise by manual workers, managers and safety professionals in the industry and trial runs. These items are divided into four categories: housekeeping, access to heights, scaffolding and personal protective equipment. Each



category contains six items scored against an eleven-point proportional scale. A proportional scale, rather than an all-or-nothing scale, provides a more stable and sensitive measure of site safety (Cooper, 1991). This audit system is a successful tool for providing objective and reliable measurements of safety performance on construction sites (Philips, *et al.* 1991).

The fact that the UMIST audit tool is deliberately biased towards identifying hazardous situations presents two conceptual problems. First, these situations are the result of past human behaviour, with the potential to produce a future loss incident, depending upon future behaviour, they may not therefore be a very good measure of safety. An unsafe situation can be made safe by worker behaviour, eg, an untied ladder may be tied or footed when used by a worker. Second, unsafe behaviour items inevitably involve an unsafe situation. Despite these conceptual limitations the audit provided the basis for producing a valid measure of physical aspects of construction site safety performance. Emphasis easily identifiable, common situations and the proportional nature of the scoring system made the measure applicable to the safety analyses of construction sites in most situations.

The UMIST site audit tool was used for measuring aspects of construction site safety in the Caribbean in its original form, and in a revised form in Britain. The results from the UMIST study are used as comparative data with the Caribbean audit scores. The sites audited in Britain formed part of a major civil engineering project that had different specific risks to those examined by the UMIST audit tool. Additional audit categories were formulated for tunnelling works including shotcreting procedures, underground rail transport and emergency procedures and added to the UMIST audit tool. The expanded audit tool was used to audit both tunnelling and station construction works.

The emphasis of the audit is restricted to proximal site causes of accidents rather than distal causative factors, eg poor organisational risk management. The focus of the UMIST site audit tool on either unsafe acts or unsafe

conditions on site, derives from the behavioural science approach focusing on the proximal causes of accidents and the prevalence of this philosophy in accident causation in the safety culture of the British construction industry. The concentration upon the unsafe acts and unsafe conditions theory of accident causation restricts the analysis, to the exclusion of the initiating latent failures and controlling role of organisations in the accident causation process. Subsequent work by UMIST identified management commitment as the key determinant of site safety performance (Robertson, *et al.* 1999).

### 7.3.2 Safety Climate Scales

Initial literature searches revealed four key studies relating to the measurement of safety climate namely, Zohar (1980), Brown and Holmes (1986), Dedobbeleer and Beland (1991) and Cooper, *et al.* (1991). The seminal paper by Zohar prompted the examination of safety climates in different industries operating in different countries around the world. Elements of the work of: Cooper, *et al.* (1991, 1992, 1994); Dedobbeleer, *et al.* (1987, 1989, 1990); Hinze, *et al.* (1976, 1978, 1979, 1981) and Leather (1987, 1988), are incorporated into this study. Cooper, *et al.* (1991, 1992) and Leather (1987, 1988) examine in detail, workers' attitudes to safety-related items in the British construction industry. The combination of items included on these two scales corresponded with those used in the work of Dedobbeleer, *et al.* (1987, 1989, 1990).

#### *UMIST Safety Climate Scale*

Cooper, *et al.* (1991) developed a safety climate scale to measure construction workers' attitudes to safety related issues on construction sites. Following Zohar (1980), this scale assesses employees' attitudes to safety management, their perception of risk and their behaviours and attitudes relating to safety. This measure was used throughout the fieldwork for assessing the attitudes of workers as part of safety culture of construction sites. The UMIST safety climate measure included items relating to worker attitudes to:

- ♦ management attitudes towards safety;
- ♦ perceived importance of safety training;



- ♦ perceived level of risk on site;
- ♦ perceived effects of work pace on safety;
- ♦ effects of safe conduct on social status;
- ♦ role of the foreman;
- ♦ formal safety management; and
- ♦ bonus payments.

Workers' attitudes are recorded against a five-point Likert scale anchored between highly disagree (1), and highly agree (5) (Appendix 2.2). Originally consisting of 36 items, this measure was reduced to 26 items after trials in Trinidad and Tobago demonstrated the non-applicability of items relating to formal safety training, safety policies, bonus schemes and safety regulations. These behaviours were generally not found to be part of the safety management culture of construction companies in the Caribbean. Cooper and Phillips (1994) assign secondary status to the items found to be non-applicable to the Caribbean safety culture.

#### *Leather's Attitude Scale*

Leather (1987, 1988) studies the safety related attitudes and behaviours of workers' in the public and private sector of the British construction industry. He developed an attitude scale, relating to workers' perceptions of locus of control over safety, which measures the relative strength of attitudes of construction workers to the importance of:

- ♦ individual care and attention;
- ♦ work mates attitudes and behaviours;
- ♦ the foreman;
- ♦ bonus payment schemes;
- ♦ employers status as a model of desired attitudes and behaviours;
- ♦ perception of experience as promoting safety or complacency; and
- ♦ risk taking as an individual decision or an organisational necessity.

Leather's scale of construction worker attitudes (Appendix 2.3) is used in this study as a comparative tool to measure differences in attitudes to safety between construction workers in Britain and the Caribbean. His original scale consists of 12 questions, scored on a five-point Likert scale. The two items relating to bonus schemes were removed from the scale because such schemes proved to be generally absent in the Caribbean.

#### *Likelihood Scale*

Accidents to people are rare events and accident severity, ie the extent of injury, is difficult to predict accurately due to the number of variables involved in injury causation. Workers' perception of risk rather than their accident experience was examined in this study. Following Leather and Butler (1983), people's experiences within the construction industry should be reflected in their attitudes towards dangerous situations. Cooper, *et al.* (1991) developed a measure of perceived risk as part of the process of formulating their Construction Site Safety Performance Audit. The attitude measure consisted of three scales measuring the frequency, likelihood and severity of accidents in seventy-one hazardous situations commonly found in the British construction industry. The likelihood scale (Appendix 2.4) was used in an abbreviated form to measure the perceived risk from common hazardous situations and behaviours found on construction sites.

The scale contains fourteen items which relate to behaviours and situations commonly found on construction sites. Items include three questions relating to the safe use of ladders, four questions relating to the use of vehicles on site, and seven relating to the general site environment and safety related behaviours. One item was developed specifically for the Caribbean situation, reacting to the common practice of the use of single boards for working at heights.



### *Factor Analysis*

Factor analysis is a statistical method, based on the multiple regression equation, used for the identification of underlying constructs or factors that explain the correlation's among sets of variables (Kline, 1994). Factor analysis identifies correlations arising from the shared variance of each variable and is therefore a useful tool for summarising the correlation's amongst large numbers of variables by producing a smaller number of statistically valid, derived variables. The factors identified by factor analysis should, as Kline (1994) stresses, be validated against external criteria. Factor analysis using SPSSx (Statistical Package for the Social Sciences) for Windows is applied to the data collected on the UMIST Safety Climate Scale and Leather's Attitude Scale and is triangulated with ethnographic data.

The production of a correlation matrix, the set of correlation coefficients between variables, is the starting point of principal component factor analyses. Correlated factors may be rotated to make them more interpretable and significant factors extracted to assess how well the chosen model fits the data. Eigenvalues measure the total amount of variance between the sum of the squares of the factor loadings of each factor, are derived from the correlation matrix are used to select the number of significant factors (those with Eigenvalues >1). *Variamax* rotations were performed on the correlation matrices produced, to achieve a simple structure for analysis.

Statistical tests such as Bartlett's test of sphericity and the Kaiser-Meyer-Olkin measure of sampling adequacy may be used to establish the validity of the data sets. Bartlett's test of sphericity is designed to determine whether the correlation matrix is an identity matrix (ie all diagonal terms are one and all off diagonal terms are 0), from a multivariate normal population. The test is based on a chi-squared transformation of the determinant of the correlation matrix. If the score is large and the associated significance is small, the hypothesis that the correlation matrix is an identity matrix can be rejected. The Kaiser-Meyer-Olkin measure of sampling adequacy is an index for comparing

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the magnitudes of the observed correlation coefficients. Scores below 0.50 indicate that the sample is not suitable for factor analysis (Kline, 1994).

### *7.3.3 Interview Schedules*

Following literature reviews, the researcher's experience as a Factory Inspector and discussions with colleagues in the HSE and in the Health and Safety and Psychology units of Aston University, several interview schedules were devised. The issues explored in these schedules were identified as significant influencing factors upon the safety culture of the construction industry. These schedules examine the role of construction companies, trade unions and employers' organisations and the labour inspection bodies.

#### *Site Safety Interview Schedule*

An eleven-item interview schedule was developed to assess behavioural aspects of the construction site environment as perceived by construction personnel. Based largely on Hinze's (1981) examination of the influence of human factors upon site safety in the North American construction industry. This schedule consists of 11 questions relating to factors positively correlated with low accident and high safety performance construction companies. Questions relating to the personal relations between workers on site, their feelings about locus of control regarding safety and the size of work gangs are included. Some of these items are duplicated on the other scales used in this study (Appendix 2.5).

#### *Caribbean Construction Company Safety Management Interview Schedule*

This nineteen-item schedule, which reviews the arrangements in place for the management of safety was developed for the structured interviewing of Caribbean construction company directors and project managers (Appendix 2.6). It explores issues such as the types of contract used, project planning, safety responsibilities, accident reporting, union recognition and safety training provision.



*Trade Union and Employers Group Interview Schedule*

A fourteen-item schedule was developed for interviewing Trade Union and Employers' organisations. Questions on the schedule related to the provision of safety training and tripartism (Appendix 2.7).

*Government Agency Interview Schedule*

The Government Agency interview Schedule examines the structure, function and methods of work of Caribbean government agencies responsible for the enforcement of health and safety legislation (Appendix 2.8). This schedule's 22 questions were posed to Senior Factory Inspectors and Labour Commissioners. It explores issues such as the use of checklists in inspection work, occupational health and safety legislation and its enforcement.

*JLEP Safety Management Audit*

A safety management system audit was formulated to examine the JLEP contracts' safety management systems following the general principles of safety management detailed in the HSE document *HSG65 Successful Health and Safety Management* (HSE, 1991). The audit question set examines the efficacy of the safety management arrangements for planning, implementing, monitoring and reviewing performance (Appendix 2.9).

## **7.4 Data Collection**

### ***7.4.1 Data Collection in the Caribbean***

Caribbean component of his study was initiated by a mail shot to relevant organisations in the Caribbean. Letters of introduction, intent and a request for co-operation, were sent to governments, trade unions, employers' organisations, construction companies and the ILO representatives at the Caribbean Labour Advice Centre (CLAC). Sufficient positive replies prompted the finalisation of the study plan. The research was conducted in accordance with the research proposal with regard to the contact of organisations, arrangement of site visits, etc. Deviation from the original proposal occurred only in terms of the time taken to complete the fieldwork, as a contingency style of project management had to be employed in the face of local factors.

Caribbean construction companies were identified by discussions with people working in the industry and use of the Yellow Pages. Companies were selected on the basis of having current significant works and their willingness to co-operate with this study. Safety management arrangements were discussed with directors and project managers of the companies involved in this study. Audits of safety related behaviours and situations were undertaken on the construction sites visited. Attitude measures, and interview schedules were utilised during interviews with construction workers.

Over 70 construction sites were visited during the fieldwork in the Caribbean, 59 of which were audited using the UMIST Construction Site Safety Performance Audit. The audit was used to collect data on projects such as shopping malls, apartments, hotels, offices, schools, and civil engineering projects, eg, water treatment schemes and airports. Also visited but not audited were smaller sites and road construction projects. The formal Caribbean construction sector, as opposed to the more informal house building sector, was examined.

Over 200 construction personnel were interviewed using attitude scales and interview schedules. Interviewees included company directors, surveyors, engineers, project managers, trades people and labourers. Sixty-one construction companies were visited and their arrangements for safety discussed. Eleven of these companies were foreign owned (ie non-Caribbean based companies), of which eight originated from Britain. Only five of the companies approached refused to co-operate with this study.

Structured interviews were conducted with government officials, company directors, project managers and representatives of trade unions and employers groups. primarily on a one-to-one basis. During interviews with site workers, groups as large as fifteen would gather and join the lively discussions which each question would raise. The scale responses recorded were, however, restricted to randomly selected groups of around five construction workers.



Following the data collection techniques in the Caribbean advocated by Abdullah (1986) and Alleyne and Benn (1979), interviews were conducted on an informal basis with an explanation given of the aims and purposes of the study before questioning commenced. Site interviews were conducted with groups of five workers in the Caribbean and Britain to facilitate discussion and data collection. Specific items on the attitude scales were rephrased into everyday conversational style language in accordance with Barrow (1983). The terms:

- ♦ *worker or workman* was often referred to simply as *man*,
- ♦ *supervisor and safety officer* were referred to as *foreman* or *boss man*,
- ♦ *productivity* as *getting the work done*,
- ♦ *reckless* with *dangerous*,
- ♦ *well informed* with *knows*,
- ♦ *negative evaluation* with *thinking bad of*, and
- ♦ *adverse effect on a worker's reputation* with *a bad reputation*

All Caribbean workers responded to the UMIST Safety Climate scale and at least one other attitude scale. Leather's attitude scale and the UMIST Likelihood scales were not used in interviews with British workers. The authors' original findings are used as comparative British data for Leather's Attitude Scale and the UMIST Accident Likelihood Scale. The UMIST Safety Climate Scale and the Hinze Site Safety Schedule were administered during interviews with British workers. Fellow inspectors conducted approximately ten percent of the interviews in the Caribbean and 35% of those in Britain.

Approximately ten percent of interviews were discontinued due to the disinterest of some respondents and because of difficulties in communication on noisy sites.

Figures relating to each of the economies of the countries studied was obtained from government departments and other published sources. Access to government agencies, construction workers, construction companies, trade

unions and employers organisations was generally readily granted. Approximately 90% of construction companies approached agreed to co-operate in this study. The Factory Inspectorates of Antigua and Barbuda and Trinidad and Tobago declined to participate due to lack of resources and lack of construction industry activity. In five of the seven countries studied the researcher lodged with the families of local construction workers. The researcher was employed as an *Industrial Safety Inspector in Jamaica* for nine months.

In order to become accustomed to the particular differences in speech and lifestyle in each Caribbean country the role of the labour inspection agency was studied and background statistics collected before commencing interviewing. The national legal framework for occupational health and safety at work was examined in each Caribbean country with specific reference to the construction industry. The organisation and activities of the government bodies responsible for monitoring and enforcing safety legislation was studied. The powers bestowed upon inspectors and the techniques used by them were examined through interviews, joint visiting and literature reviews. Representatives of relevant trade unions and employers' organisations were interviewed and the degree of tripartite negotiations was reviewed in each country studied.

A record of the site environment was made prior to the auditing of the construction works which included the weather conditions, the time of day, different trades and types of plant on site. An alternative safety audit tool was developed and utilised in the first three Caribbean countries studied but was discontinued when significant agreement was found between the results of the two audit measures. A ranking scale devised by Leather (1987) was used briefly but discontinued due to Caribbean respondents' reluctance to rank on a ten-point scale, a three-point scale being preferred (Appendix 2.10).



#### ***7.4.2 Data Collection in Britain***

The original methodology aimed to collect data from British construction sites that were of a comparable size and similar nature to those audited in the Caribbean to ensure the face validity of both samples. The author conducted site safety auditing and interviews on the largest construction sites and civil engineering projects active in the anglophone Caribbean in the early 1990s. The majority of these projects would be considered medium size when compared with British works. Attempts were made to collect data from construction sites of comparable size and nature to those audited in the Caribbean whilst employed as an HSE construction inspector in London. However, it proved impractical to collect data to use for comparison purposes due to site management's reluctance to allow workers time to take part in this study and suspicions of the motives of the government inspector conducting this work.

The author was subsequently assigned to the JLEP, an extensive construction project consisting of 36 surface sites, including station buildings, linked by train tunnels. The JLEP was the largest British construction project in the mid 1990s. The author was given permission to undertake safety culture audits of three of the principal contracts run by different consortiums of major civil engineering contractors on the JLEP. Each audit took approximately one month to plan, execute and report upon.

The site based phase of the audit took a team of two HSE construction inspectors three to four days on each site. During the audits inspectors administered the UMIST safety climate scale and the site safety interview schedule to 94 workers. They also used a revised site audit tool (A2.1.2) and a health and safety management system audit based on HSG 65 (A2.9). This audit question set was administered to members of staff identified by both vertical and horizontal slices through the management system. The information collected during these audits was presented to site personnel and

improvement plans agreed, and is anonymised and used as evidence of the nature of the safety culture of the British construction industry in this study.

#### 7.4.3 Comparability of Samples

The enforced use of the JLEP for comparative British data appeared, at least at first sight, to offer poor face validity. However, more thorough analysis reveals that the differences between the JLEP and Caribbean sites are more apparent than real. Despite the differences between the complexity and scale of the JLEP and Caribbean sites, the JLEP provided a comparable sample of British construction contractors, workers and site hazards. The majority of the works involved major British contractors employing carpenters, labourers, masons, steel fixers, etc. to construct concrete or steel framed buildings. Each contract audited was a separate major construction project managed by a dedicated site management team staffed by employees of the consortiums of major civil engineering contractors. Most manual workers were employed by subcontractors specialising in specific trades, such as carpenters, masons and electricians, or specific activities, such as steel fixing and concreting.

Construction hazards common to both the Caribbean and the JLEP include cement, dusts, electricity, falls from height, lifting operations, manual handling, noise, trips, unguarded machinery, unstable structures, vehicle movements and vibration. Apart from the specialist tunnelling operations, there was significant correspondence in construction processes. Apart from 12 miners included in the British sample ( $n = 94$ ), JLEP construction workers formed a representative sample of the British construction industry. Workers from all over Britain were employed on the project thereby reducing any specific regional bias resulting from focusing on a London based project. Carpenters, masons and labourers form the majority of both samples of construction workers (see Table A3.18 - Appendix 3). Inspectors helped administer safety climate scales in both regions.

However, in other areas the comparisons are less appropriate between the Caribbean construction projects and the JLEP. Therefore, the results from



previous related construction industry studies are used to obtain valid comparative data. The authors of the UMIST site audit tool utilised it on a comparable sample of British construction projects and their results are used for comparison with the Caribbean data. Time restrictions on interviews held on British sites forced the dropping of one of the safety climate scales. Leather's safety climate scale was not administered on British sites because his results already provide comparative data with that derived from Caribbean workers. The sophisticated nature of JLEP safety management systems contrasts sharply with Caribbean company approaches and prompted the development of a health and safety management system audit based on HSG 65. The high safety performance scores achieved by some of the JLEP contractors in relation to both physical site standards and safety management was facilitated by the prior knowledge of the nature and dates of the audits, unlike the Caribbean projects.

## 7.5 Summary

Data for this study is gleaned from the use of interview schedules, site safety auditing, general observations and official statistics. This combination of methods aimed to produce a holistic analysis of culture and to allow the triangulation of data to minimise observer bias. Table 7.1 summarises the scales used in this study. Both descriptive and inferential statistics are used to analyse the results of the ordinal data gained from the attitude scales. The mean results of the data collected from Britain and the Caribbean are compared for each item, on each scale and for the total mean results for each scale. Factor analysis was carried out on the data collected on the UMIST Safety Climate Scale and Leather's Attitude Scale to identify underlying factors. The following section details the findings of this work.

**Table 7.1 Summary of Measures Used in this Study**

Measure	Author	Original No Items	Actual No of items	Focus	Comments
<i>Physical Safety Audit</i>					
Site Safety Audit	Cooper, <i>et al.</i> (1991)	24	24	Sites audited in the Caribbean	Some items not relevant
Revised Site Safety Audit	Peckitt	24	24	JLEP works audited	Tailored for JLEP works audited
<i>Interview Schedules</i>					
Government	Peckitt	22	22	Caribbean Government Officials	
Company	Peckitt	19	19	Caribbean Construction Company Directors	
T U / Employers Schedule	Peckitt	16	16	Caribbean T U / Employers Organisation	Includes TU and Emp, ILO, UNECLAC
Site Safety Schedule	Peckitt after Hinze	11	11	Caribbean and British Manual Workers	Developed in Barbados
<i>Safety Management Audit</i>					
HSG 65 based audit	Peckitt	X	X	JLEP contractors safety management systems HSG 65 audit	Variable question sets
<i>Attitude Scales - Caribbean and BRITAIN</i>					
Safety Culture Scale	Cooper, <i>et al.</i> (1991)	36	26	Caribbean and British Manual Workers	Ten non-applicable items removed
Attitude Scale	Leather (1987)	12	10	Caribbean and British Manual Workers	Two non-applicable items removed
Likelihood Scale	Cooper, <i>et al.</i> (1991)	71	14	Caribbean Managers and Manual Workers	new item created
Ranking Scale	Leather (1987)	9	9	Caribbean Manual Workers	Discontinued in Caribbean



## *Chapter Eight: Results - Site Factors*

This analysis of safety culture in the construction industry examines cognitive, behavioural and situational aspects of safety culture at the site, company, industry and societal levels. The results from site safety auditing and general site observations are used to assess aspects of site safety in both Britain and the Caribbean. Safety climate scales and interview schedules, used during focused interviews with construction workers, managers and directors, examine attitudes and values prevalent in the safety culture of the construction industry. Conversational material collected during the course of interviews with people in Caribbean companies, governments, employers organisations and trade unions, provides additional ethnographic information on attitudes and values. This chapter examines site specific safety related attitudes and behaviours in the safety culture of the two regions.

### **8.1 Construction Site Safety Related Behaviours**

This section describes the characteristics of the construction projects visited in Britain and the Caribbean during this study. It presents the results of site safety auditing and compares the findings for the two regions. Regionally specific construction behaviours and practices and their impact upon safety are examined.

#### *Caribbean Construction Project Characteristics*

Fifty-nine of the largest active construction projects were studied in seven Caribbean countries during 1992 and 1993. Three-quarters of the projects visited in the Caribbean involved the construction of concrete framed structures. Most projects had private sector clients, except in Trinidad where the public sector accounted for 60% of the projects studied. Project values ranged from a £60,000 demolition job in Saint Lucia up to a £20 million electricity generation project in Jamaica. Project lengths ranged from two to 60

months while the average number of workers on site was 48. Most buildings were three stories in height or less, however, taller buildings were common in Barbados, Jamaica and Trinidad (Appendix 3.16). Concrete mixing plant and excavators were the most common pieces of plant on Caribbean sites. Cranes were only common on construction sites in Jamaica and Trinidad, while in Guyana, many are employed on coastal land drainage works.

Interviews with 153 male construction site workers were conducted on sites in the anglophone Caribbean between 1992 and 1994. Employment was divided equally between main contractors and subcontractors on sites in the Caribbean (Appendix 3.17). The most common site activities on projects visited in the Caribbean were groundworks, blockwork, carpentry and painting. Carpenters, labourers, masons, and painters were the most common trades (Appendix 3.18).

Interviews with workers took place in the islands of Trinidad, Saint Vincent, Union, Mustique, Barbados, Saint Lucia, Anguilla, Jamaica and in Guyana on the South American continent. Ninety percent of Caribbean workers interviewed were experienced, mature, Afro-Caribbean men. Ninety-two percent were over 25 years, 45% were over 34, while only eight percent of the sample were under 25 years of age. The average rate of pay for manual trades in the Caribbean construction industry was approximately £8 per day.

#### *British Construction Project Characteristics*

The Jubilee Line Extension Project (JLEP), the largest construction project in Britain in the mid nineties, involved the construction of railway tunnels and stations around existing over ground and underground rail systems in the centre of London. The JLEP consisted of 36 sites, 25 km of tunnels, 11 stations and numerous vent shafts and control buildings across central London. The project was originally scheduled to last 4.5 years, employ around 4000 workers and cost around £900 million. However, it was delivered two years late and cost twice as much as originally forecast (BBC News, 1999).



This government sponsored project was an integral part of the Canary Wharf development, but the start was delayed due to financial uncertainties. London Underground Limited (LUL), the client for the JLEP, had instituted the ISRS safety management system following the recommendations made by the inquiry into the Kings Cross Fire in 1988. The LUL project management team for the JLEP took a proactive approach to safety management, with systems and procedures following ISRS principles. The production of risk assessments, method statements and safety plans were contractual requirements. The JLEP had its own safety management system that included a team of site safety inspectors. Many of the staff and workers employed on the project came from the Channel Tunnel project.

The JLEP was divided into fifteen main civil engineering and construction contracts, and numerous specialist work contracts. Contract value ranged between £64m and £157m, while the number of people employed on each contract ranged from approximately 100 to over 1000. The principal civil engineering contracts were let to joint venture partnerships between major contractors from Britain, Europe and Japan. Major British contractors formed partnerships between themselves and/or non-UK contractors to combine their respective skills and resources to meet the project demands. The joint ventures audited consisted of the following combination of contractors:

- ♦ two major British civil engineering contractors;
- ♦ a major British civil engineering contractor, a French owned specialist piling contractor and a specialist German contractor; and
- ♦ a Franco-Japanese partnership which employed two large Irish owned specialist subcontractors.

These three major contracts involved the construction of major station buildings and associated and running tunnels. Common site activities included carpentry, concreting, lifting operations, manual handling, masonry, scaffolding, steel fixing, tunnelling, transport, use of power tools and working at heights. The site management teams employed predominantly British

nationals. Workers were employed by large specialist trade subcontractors, labour only subcontractors, and the major British civil engineering companies. People working on the project came from all parts of the British Isles, Europe and Asia. Many of the miners were Irishmen who travelled around the world working on major tunnelling projects. Rates of pay varied from around £250 per week for a labourer to £1,000 per week for a miner. Most manual workers were paid a production related bonus.

### 8.1.1 Site Safety in the Caribbean

Fifty-nine construction sites were audited in the Caribbean using the UMIST site audit tool. The sites audited were the largest construction projects active in each country during the period of study. Appendix 3.16 details the site audit scores for each Caribbean country. The mean site safety score for the Caribbean Region was 57%, the highest scoring country was Saint Lucia with an average site score of 61% safe, while Guyana achieved the lowest average score of 43% safe (Table 8.1).

**Table 8.1 Caribbean Site Audit Results: Mean Site Safety Scores**

<i>Site Audit Category</i>	<b>Anguilla</b>	<b>Barbados</b>	<b>Guyana</b>	<b>Jamaica</b>	<b>Saint Lucia</b>	<b>Saint Vincent</b>	<b>Trinidad and Tobago</b>	<b>Mean Category Score</b>
<i>Sites</i>	n = 3	n = 9	n = 8	n = 13	n = 10	n = 6	n = 10	n = 59
<i>Housekeeping</i>	81	81	69	71	82	78	84	78
<i>Scaffolding</i>	20	41	48	42	54	62	48	45
<i>Access</i>	84	67	33	77	83	79	74	71
<i>P.P.E.</i>	46	40	21	51	26	15	31	33
<b>Country Mean Site Safety Score</b>	58	57	43	59	61	59	59	57

The Caribbean mean score for housekeeping was 78% safe. Sites visited were generally clean and tidy with little rubbish or debris left around site. Nails were usually removed from timbers as both are often reused, few materials were stored on site, and debris was absent from scaffold lifts. Edge protection



was often absent where there were risks of falls over two metres such as at openings within buildings, eg, at shafts and at the edges of structures.

Caribbean scaffolds were poor in relation to British legal standards, achieving an average score of 45% safe. Guard-rails, toe-boards and fully boarded platforms were rarely provided. Warning signs were not placed upon incomplete scaffolds. However, base supports to standards were often provided to both scaffolds and falsework, while trapped boards were very rare. Scaffolds were not used as full working platforms nor for the loading of materials as they tend to be in Britain, but for access to carry out light duties such as plastering or painting. The majority of scaffolds were constructed from timber and were progressed with and attached to the building (Photograph 8.1). Metal tube and fitting scaffolds and system scaffolds were comparatively rare except in the countries with little forest resource (eg, Barbados).

Access was generally good on all sites visited with an average score of 71%. Ladders were made on site from timber for specific tasks and were therefore the correct length for the tasks for which they were used and were rarely used unsafely. Ladders were often secured at the top or at the base by a piece of timber nailed to the floor slab (Photograph 8.2). Most of the ladders encountered in the Caribbean were up to twice as wide as the standard British pole ladder and were often made of substantial pieces of hardwood timber.

**Photograph 8.1 Typical Caribbean Wooden Scaffold (Jamaica, 1993)**

**Photograph 8.2 Typical Access Ladder (Trinidad, 1992)**

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Illustration removed for copyright restrictions



Workers stated that the people using these ladders were generally the people who had constructed them, and thus had an interest in ensuring their safety. Despite being made on site, the nature of their construction meant that most ladders in the Caribbean could not be described as unsafe, and in conversation with many workers no one could relate an accident occurring due to a failure of one of these ladders. Ladders that had rungs which were rebated or blocked onto the styles were scored as safe on the audit, whilst the ladders that had rungs only nailed onto the styles were scored as unsafe on the relevant audit items. Approximately half of the ladders seen were marked as having defective rungs because the rungs were merely nailed to, rather than rebated into the styles.

Photograph 8.3 PPE (Jamaica, 1993)

The provision and wearing of personal protective equipment (PPE) was generally poor with a mean score of 33%. Helmets and boots were rarely provided, but were usually worn by workers when provided (Photograph 8.3). Because of the relatively infrequent use of mechanical equipment and chemicals, and the open site environments, little PPE, except for boots and

helmets, was required. Workers often protected their heads and necks from the sun with a piece of cloth.

The original UMIST site safety audit tool proved to be generally applicable to the Caribbean construction industry. The housekeeping, access to heights, and PPE categories proved to be suitable for assessment of aspects of safety-related behaviours on Caribbean construction sites. Scaffolding items in the audit proved least applicable to safety-related behaviours on Caribbean construction sites. Three of the six scaffold items did not correspond with Caribbean construction site practices. Caribbean scaffolds tend to be fitted with only a single wooden board to form a working platform or access way and lack toe-boards and guard rails (Photographs 8.4 and 8.5).

**Photographs 8.4 and 8.5 Single Board Working**

Photograph 8.4 - Jamaica (1993)    Photograph 8.5 - Anguilla (1992)

The majority of Caribbean scaffolds would be classed as unfinished and unsafe by British legal standards. There was an absence of warning signs on incomplete scaffolds in the Caribbean. Provision of warning signs was a legal



requirement only in Jamaica and Guyana, where it was not actively followed or enforced. The UMIST audit scaffold item regarding the posting of warning signs on unfinished scaffolds was therefore not scored in the Caribbean.

Toe-boards are rarely fitted to scaffolds or other elevated working places, and trestles are not used on scaffolds in the Caribbean. Appendix 3 examines specific Caribbean construction practices in more detail.

A behavioural study in Hong Kong by Rowlinson and Lingard (1996), which used the UMIST site audit tool, also found that the scaffold category proved less relevant than the other audit categories. They found no improvement in scaffold safety and considered that this was due to the work practices of specific trades and the perceived time cost of providing scaffold safety features. These authors concluded that these factors were a lot more difficult to overcome than the other issues covered by the other audit categories.

#### *Comparison of UMIST site safety audit scores.*

The combination of site audit results for phase one and two of the HSE sponsored UMIST research project provide average pre-intervention baseline scores from the auditing of 27 construction sites in England (Duff, *et al.* 1993; Robertson, *et al.* 1999). The Caribbean Region scored an average site safety score of 57% which can be compared with the average pre-intervention base-line score for British sites included in the UMIST study of 77% (Table 8.2).

**Table 8.2 Mean Site Audit Results (% Safe) for British and Caribbean sites**

Audit Category	UMIST British Sample n = 27 Duff, <i>et al.</i> (1993) Phase I + Robertson, <i>et al.</i> (1999) Phase II	Caribbean Sample n = 57
Houskeeping	77	78
Scaffolding	79	45
Access	81	71
P.P.E.	71	33
Mean Score	77	57

The two samples achieved almost identical average scores for the housekeeping category of the audit. The Caribbean sites produced a marginally lower average score for the access category and significantly lower

scores than the British sample on the scaffold and PPE categories. The audit successfully identified key differences between the safety performances of sites in Britain and the Caribbean. The main differences identified were the poor provision of fall protection and personal protective equipment in the construction industry of the Caribbean when compared with Britain.

#### *8.1.2 Site Safety in Britain - Jubilee Line Extension Project (JLEP)*

Site behaviours on three contracts on the JLEP were audited using the customised site audit tool (Appendix A2.1.2). The sites audited were involved in the construction of stations, tunnels and associated buildings. Activities ongoing at the time of site auditing included: block laying; carpentry; concreting; lifting operations; plant movements; scaffolding; steel fixing; tunnelling operations using hand, tunnel boring machines and shotcrete techniques; and underground rail transport.

Every site made extensive use of tower cranes, mobile cranes, concrete and shotcrete batching and pumping plant, underground rail transport, compact dumper trucks, forklift trucks and excavators (Photograph 8.6). Proprietary aluminium and formwork systems were used on all contracts. Pneumatic, petrol and electrical powered hand tools such as breakers, grinders and skill saws, were common. Thirty foot long pole ladders, the industry standard for access around scaffolds, (Photograph 8.7) are constructed from softwood timber with reinforcing wires below the rungs which are rebated into the styles. Aluminium step ladders and metal trestles with scaffold board platforms are commonly used for access to short duration works. Some proprietary metal staircases were used on semi-permanent designated access routes.





Illustration removed for copyright restrictions

*JLEP Site Audit Scores*

The revised site audit tool included items relating to site transport, health matters and tunnel fire safety. Physical site conditions observed were generally very good with an average site safety audit score of 89%. High standards were observed with regard to the use of ladders, scaffolds, certificated plant operatives, PPE and fire precautions underground (table 8.3). The high standards observed bore testament to a great deal of effort to get things right for the audits that were time-tabled in advance with contractors.

Table 8.3 JLEP Safety Management Audit Scores

CATEGORY	CONTRACT 1	CONTRACT 2	CONTRACT 3
<b>Ladders and Scaffolding</b>	84	94	79
<b>Access and Transport</b>	90	95	81
<b>Health Matters</b>	90	88	92
<b>Tunnel Fire Safety</b>	96	90	90
<b>MEAN SCORE</b>	<b>90</b>	<b>92</b>	<b>86</b>

At the time of the site audits most matters relating to housekeeping, scaffolds, access, ladders and safe systems of work scored highly. Permits to work were correctly used in most cases and emergency procedures were clearly marked. Some ladders were however, damaged or used incorrectly, while some items of plant used underground including rail locomotives, did not have fire extinguishers fitted. Many smaller items of lifting gear used in underground tunnelling operations were used unsafely and poorly maintained while air winches and grout pans were commonly inadequately guarded.

Most access routes were kept clear of obstructions on the sites audited and were often marked by scaffold barriers or painted lines. However, unsafe access was a hazard on the more congested sites and for short duration works (Photograph 8.8). Poor access was provided for slinging work on large formwork shutters and other short duration works. Materials were frequently found stored unsafely such as bricks and blocks placed on scaffolding without brickguards to prevent the materials falling. Some elevated work platforms did not have adequate edge protection.



The provision and wearing of PPE on sites was good with hard hats, high visibility clothing, safety boots and hearing protection being provided by contractors and worn by the majority of workers when required. However, workers were frequently observed not wearing protective goggles when using compressed air and when scabbling, and some site workers stated that they had problems getting the appropriate PPE from stores due to an excessively bureaucratic systems and the long distances between their work locations and the stores.

Photograph 8.8 Poor Access (JLEP site 1996)



### *JLEP Site Practices*

There were enormous technical complexities involved in constructing an underground railway below one of the most populous cities in the world, often in poor ground, under two principal railway and the many miles of old brick viaducts. Construction methods ranged from state-of-the-art earth pressure balance tunnelling machines, compensation grouting techniques and the New Austrian Tunnelling Method (NATM) (Photograph 8.9) to eighteenth century hand tunnelling techniques (Photograph 8.10). Accidents and cases of ill-health resulting from the use of these techniques include cases of decompression

sickness, dermatitis, lacerations and broken bones. Technical difficulties were compounded by political imperatives and the fragmented and adversarial nature of British construction industry.

Photograph 8.9 NATM - Spraying Concrete to Form Tunnel Linings (JLEP 1996)



Proprietary aluminium systems and semi-automated systems were used extensively for casting concrete in both tunnels and station structures, while acro-props and plywood decking sheets were used in smaller and confined areas. Concrete was often batched on site or delivered by mixer trucks, and then pumped around site. Edge protection was usually provided to access ways and working platforms from which persons could fall more than two metres, except for relatively short or minor works. Safe systems of work and safe means of access were generally maintained, however, there were numerous occasions when steel-fixers, carpenters and labourers were observed working at height without any fall protection. Externally, in situ cast concrete, glazing or cladding panels were commonly used, while most internal station walls were constructed solid concrete blocks, often weighing in excess of 25 kg.



**Photograph 8.10 Hand Tunnelling (JLEP 1996).**



Procedures detailing safe systems of work were often formulated in method statements, but not followed during the actual execution of work. This was particularly true for small scale ancillary works. There was little compliance with relevant legislation regarding safe manual handling, and the assessment and specification of safe substances and materials. Miners, steel fixers and formworkers frequently worked at heights without fall protection, locomotive drivers often failed to make correct signals and checks of equipment, and pressurised systems were cleaned without appropriate precautions being taken. Signs often did not conform with the law, some first aid locations were poorly marked, while health risks from chemicals, dusts, manual handling, noise and vibration were not well managed.

HSE Inspectors identified many unsafe activities and served Prohibition Notices to stop dangerous practices and Improvement Notices to ensure the implementation of effective safety management systems, safe systems of work,

safe systems for materials storage, safe maintenance procedures and the provision of fire suppression systems on tunnelling machines. Prosecutions were taken in relation to failures by contractors to maintain locomotives, provide safe systems of work and safe methods of lifting.

### *Summary*

Despite the differences in scale and technical complexity of the construction projects studied in Britain and the Caribbean, the results of site safety auditing highlight valid similarities and distinct cultural differences between the two construction industry cultures. Housekeeping was relatively good in both samples, but methods for gaining access to heights and the provision of PPE are areas of cultural difference. Wooden scaffolding predominates in the Caribbean, while metal scaffolding is the norm in Britain. Edge protection and complete boarding to working platforms are rare in the Caribbean, but are recognised standards in the British construction industry. Ladders are custom made on sites in the Caribbean, but factory manufactured in Britain. The provision of PPE is poor in the Caribbean, but good to variable in Britain. The audit tool also highlighted differences between Caribbean countries indicating a link between economic development and the provision of PPE, and the poor standard of ladder safety in Guyana.

## **8.2 Safety Climate**

Cognitive aspects of construction site safety culture are examined by a combination of attitude scales and interview schedules which capture the relevant dimensions of safety culture, allowing the triangulation of the findings. Four different tools are used to assess attitudes to risk, safety management, productivity, personal locus of control and sense of rushing. Small groups of workers were interviewed on construction sites in Britain and the Caribbean to examine the safety climate within each safety culture. The mean results for the three psychometric scales and the interview schedule are considered and compared between the two samples. Factor analysis is applied to responses to UMIST's and Leather's scales.



### 8.2.1 UMIST Safety Climate Scale

This section summarises the results from the use of the UMIST safety climate scale in Britain and the Caribbean. After initial trials in Trinidad, ten items, relating to safety training, bonus schemes and safety regulations, were removed from the original scale because they did not generally relate to Caribbean site practices. The resulting 26-item scale, consists of twelve items relating to workers' attitudes towards management (including the foreman), and twelve to workers' perception of risks, work pace, and fellow worker behaviours and attitudes. The items score on five-point Likert-type scales, anchored on the dimensions *highly disagree* to *highly agree* (Appendix 2.2). The total sample size is almost 250, with 153 Caribbean workers and 94 British workers from JLEP interviewed using this measure.

#### *Items Relating to Management Attitudes and Behaviours*

The UMIST scale contains eight items relating to workers' perceptions of management attitudes and behaviours (Table 8.4). British and Caribbean samples were both generally positive about management's role in safety. Both samples were, however, not very convinced that management would invest money in safety. Over 80% of the Caribbean sample positively scored the items relating to management's control of risk and willingness to adopt new safety ideas. The British sample only scored item 4 (*Managers come down hard on safety issues*) significantly higher than the Caribbean sample.

Table 8.4 UMIST Safety Climate Scale - Management Items (mean results)

*% agree includes strongly agree	BRITAIN (n = 94)			CARIBBEAN (n = 153)				
ITEMS RELATING TO: ATTITUDES TO MANAGERS ATTITUDES AND BEHAVIOURS N= 8	Mean	std. dev.	% agree *	Mean	std. dev.	% agree*	t - value (equal)	level of signifi- cance
q1) Managers are interested in my safety	3.34	0.95	59	3.29	1.15	65	-0.31	n/s
q4) Managers come down hard on safety issues	3.64	0.94	61	3.36	0.96	55	-2.21	0.05
q8) Managers turn a blind eye to safety issues (r)*	3.39	0.95	23	3.38	0.95	25	0.10	n/s
q13) Managers are willing to invest money and effort to improve safety	3.18	0.78	40	3.18	1.08	52	0.03	n/s
q15) Managers know about safety problems and act quickly to correct them	3.51	0.84	61	3.9	0.77	81	3.74	0.01
q16) Managers really care and try and reduce risk levels as much as possible	3.45	0.74	59	3.59	0.9	68	1.36	n/s
q19) Managers are willing to adopt new ideas for improving safety	3.35	0.74	51	3.81	0.76	78	4.63	0.01
q20) Managers try to immediately control the hazards they recognise	3.77	0.66	85	3.98	0.66	88	2.36	0.05

*Items relating to the Supervisor*

Four items specifically relate to workers' attitudes towards their supervisor (Table 8.5). The Caribbean sample was generally more positive than the British sample regarding the role of supervisors in giving workers encouragement when they work safely, criticising them for working unsafely and having negative attitudes to reckless behaviour. However, a quarter of Caribbean workers thought that their supervisor pressured them into working unsafely compared to only four percent of British workers. This probably reflects the fact that front line supervisors in the Caribbean play a greater site management role compared with those in Britain. Caribbean workers scored the items relating to supervisor encouragement and criticism significantly higher than the British workers.



Table 8.5 UMIST Safety Climate Attitude Scale - Supervisor Items

*% agree includes strongly agree	BRITAIN (n = 94)			CARIBBEAN (n = 153)				
ITEMS RELATING TO : THE FOREMAN N = 4	Mean	std. dev.	% agree*	Mean	std. dev.	% agree*	t-value equal	level of significance
q3) Your foreman encourages you when you work safety	3.23	0.92	56	3.92	0.81	87	6.13	0.01
q6) Your foreman pressures you into working unsafely (r)	4.04	0.64	4	3.39	1.09	23	1.79	n/s
q7) Your foreman criticises you for working unsafely	3.65	0.76	69	3.93	0.89	84	2.58	0.01
q14) Dangerous behaviour results in the foreman thinking bad of that worker	3.61	0.9	65	3.85	0.95	84	1.95	n/s

*Items relating to the pace of work and safety*

Two items on the scale relate to workers' perception of the pre-eminence of production over safety and the pace of work. The British sample scored the item relating to rushing significantly higher than the Caribbean sample. Sixty-eight percent of workers in the Caribbean felt that they did not rush work compared to 49% in Britain. Both samples were unsure as to whether production came before safety (Table 8.6). The Jamaican sample did not score the item relating to rushing significantly differently from the rest of the Caribbean sample, in contrast to the differences found in responses to the same issue on Leathers' scale.

Table 8.6 UMIST Safety Climate Scale - Pace of Work and Productivity

*% agree (inc strongly agree)	BRITAIN (n = 94)			CARIBBEAN (n = 153)				
ITEMS RELATING TO: THE PACE OF WORK AND PRODUCTION n = 2	Mean	std. dev.	% agree*	Mean	std. dev.	% agree*	t-value equal	level of significance
q2) Getting the job done comes before your safety (r)	3.14	0.96	29	3.09	1.19	42	0.32	n/s
q9) I am often asked to rush my job (r)	2.7	1	51	3.33	1.1	32	2.98	0.01

*Items relating to worker perceptions of risk*

Six items relate to workers' perceptions of the degree of danger involved in their work are included on the scale. Both samples were unsure that it was just a matter of time before they had an accident and didn't think the site they worked on was dangerous in comparison to other sites (Table 8.7).

Table 8.7 UMIST Safety Climate Scale: Workers' Perception of Risk

*% agree includes strongly agree	BRITAIN (n = 94)			CARIBBEAN (n = 153)				
ITEMS RELATING TO: PERCEPTION OF DANGER n = 6	Mean	std. dev.	% agree*	Mean	std. dev.	% agree*	t - value equal	level of signifi- cance
q5) Your job is a dangerous one (r)	2.8	0.98	47	2.34	1.07	70	3.36	0.01
q10) You are sure it is only a matter of time before you get involved in an accident (r)	2.85	0.96	43	2.99	1.15	41	-0.97	n/s
q17) Your chance of being involved in an accident is quite large (r)	2.69	1.12	62	3.16	1.11	38	-3.20	0.01
q18) The safety problems in your job are very serious (r)	2.9	0.82	38	2.45	0.94	66	3.83	0.01
q22) You think this site is dangerous compared to others (r)	3.49	1.06	36	3.16	0.98	21	-2.52	0.05
q25) People are likely to have accidents doing the job you do (r)	3.97	0.86	28	2.55	1.02	61	5.31	0.01

Nearly two-thirds of British workers considered that their chance of being involved in an accident was quite large, while only a third responded positively to items relating to sense of risk. Only 38% of the Caribbean sample considered that their chance of being involved in an accident was quite large. However, at least two-thirds of Caribbean workers positively scored items relating to sense of risk, considering that:

- ♦ the safety problems in their work were serious;
- ♦ people doing the same work were likely to have accidents; and
- ♦ their jobs are dangerous.



*Items Relating to Attitudes to Worker Behaviours*

Twenty percent more Caribbean workers than British workers, were positive that fellow workers help others to work safely (Table 8.8). The Caribbean sample scored two of the three items relating to the interaction with supervisors significantly higher than the British sample. The majority of both samples of workers agreed that:

- ♦ they follow safety instructions;
- ♦ they report dangers to the foreman;
- ♦ being involved in an accident did not have an adverse effect on a worker's reputation; and
- ♦ workers who wear protective equipment are not considered to be cowards.

**Table 8.8 UMIST Safety Climate Scale - Attitudes to Worker Behaviours**

*% agree includes strongly agree	BRITAIN (n = 94)			CARIBBEAN (n = 153)				
<i>Items relating to: Attitudes to Worker Behaviours n = 6</i>	Mean	std. dev.	% agree*	Mean	std. dev.	% agree*	t - value equal	level of signifi- cance
q11) Men who work safely try to make sure others appreciate it.	3.68	0.72	76	4.2	0.73	96	5.48	0.01
q12) You usually inform your foreman about safety hazards because they appreciate it and try to correct it.	4.16	0.45	97	3.88	1	88	2.60	0.01
q21) Workers using PPE are not considered to be cowards but rather good and tidy workers.	4.05	0.47	85	4.18	0.72	88	1.56	n/s
q23) On this site being involved in an accident has a bad effect on workers reputation.	2.32	0.53	3	2.4	0.87	18	0.82	n/s
q24) When a worker confronts a dangerous situation he reports it to the foreman.	3.94	0.44	91	4.07	0.46	97	2.30	0.05
q26) When the foreman tells you about safety, you take it into consideration and act accordingly.	3.97	0.47	87	4.15	0.44	98	2.98	0.01

### 8.2.2 UMIST Safety Climate Scale - Factor Analysis

To determine the underlying dimensions of safety climate SPSS<sup>x</sup> factor analysis was applied to the data collected on this scale in Britain and the Caribbean.

Three analytical options were available for the factor analysis of the safety climate data collected. The first option is based on conducting separate factor analysis on the two samples of 153 and 94 to compare the factor structures derived from the two samples. The advantage of this option is that it keeps possibly dissimilar samples separate. However, the relatively small sample size of 94 on a 26-item scale reduces the case-to-item ratio to below the generally accepted minimum of 5:1 (Hair, Anderson, Tatham and Black, 1998).

The second option is conducting confirmatory factor analysis (CFA) by factor analysing the Caribbean sample (n=153) and then using the smaller British sample (n=94) to test the exploratory factor analysis derived from the larger sample. However, this option is problematic because of the relatively small size of the British sample. In addition, like other model fitting approaches, CFA can only test a very limited number of potential fits for the original factor analysis (Kline, 1994). The third option involves combining the raw data of the two samples to create a larger data pool (n= 247). The advantage of this option is that it makes for a more robust factor analysis of the climate scale because the case-to-item ratio is acceptable (Hair, *et al.*, 1998). Options one and three were followed in this study.

#### *Factor Analysis of separate samples - Caribbean sample*

The scree plot for the Caribbean sample suggests an eight-factor model that explains 64% of variance (Appendix 5.2). However, a five-factor model, accounting for 55% of the total variance, is preferred because the seventh and eighth factors identified scored close to one and factors one and six are the same. The Bartlett test of sphericity was 1233.88, while the Kaiser-Meyer-Olkin measure of sampling accuracy was good with a score of 0.69. *Varimax* rotation was achieved in 11 iterations. Table 8.9 details the items loading on the five



factors derived from the factor analysis. The labels assigned to the four factors are: 1) Safety and Risk Control; 2) Managing Operational Safety; 3) Negative Influences on Safety; 4) Accident Probability; 5) Worker Communications.

**Table 8.9 UMIST Safety Climate Scale - Factor Analysis of Caribbean Sample**

(n = 153; Varimax rotation - five factor solution; paraphrased items)

<b>Factor 1 <i>Safety and risk control</i></b>	
<i>Eigenvalue 4.7 (Explains 18% of variance + factor 6 = 5% )</i>	<b>Loading</b>
Managers know about safety problems (15)	.73
Managers really care and reduce risk (16)	.73
Managers quickly control risks (20)	.72
Managers adopt new safety ideas (19)	.68
<b>Factor 2 <i>Managing operational safety</i></b>	
<i>Eigenvalue 3.0 ( 11.6% )</i>	
Managers interested in safety (1)	.75
Managers invest in safety (13)	.72
Managers come down hard on safety (4)	.64
Foreman thinks badly of unsafe behaviour (14)	.63
Tell foreman about hazards (12)	.54
This site is comparatively dangerous (22)	.50
<b>Factor 3 <i>Negative influences on safety</i></b>	
<i>Eigenvalue 2.1 (7.9%)</i>	<b>Loading</b>
Good workers use PPE (21)	-.74
Foreman encourages safety (3)	-.69
Productivity comes before safety (2)	.53
Big chance of having an accident (17)	.50
Managers turn a blind eye to safety (8)	.48
<b>Factor 4 <i>Accident probability</i></b>	
<i>Eigenvalue 1.9 (7.1%)</i>	<b>Loading</b>
Your job is dangerous (5)	.75
People likely to have accidents on site (25)	.65
Only a matter of time before an accident will happen (10)	.54
<b>Factor 5 <i>Worker communications</i></b>	
<i>Eigenvalue 1.5. (5.7%)</i>	<b>Loading</b>
Safe workers talk to others (11)	.76
Dangerous situations reported (24)	.71

The items loaded on factor one relate to positive management actions and attitudes, including controlling recognised risks, being interested in worker safety, caring, reducing risk and coming down hard on safety. Items loading on factor two relate to communications with supervisors and their views on unsafe behaviour. Factor three loaded with items relating to negative safety features. Managers turning a blind eye to safety, productivity coming before safety loaded with the perception that there was a high risk of having an accident, and workers not using PPE and the foreman not encouraging safety. Factor four loaded with three items relating to accidents, while factor five loaded with items relating to worker communications.

*Factor Analysis of separate samples - British sample*

The scree plot of Eigenvalues for the British sample yields five factors with values over one accounting for 60% of the explained variance (Appendix 5.3). However, the fifth factor is a single factor and is therefore discounted. The Bartlett test of sphericity was 1210.45 and the Kaiser-Meyer-Olkin measure of sampling accuracy was good with a score of 0.76. *Varimax* rotation was achieved in 22 iterations. The four factors detailed in Table 8.9 are assigned the following labels: 1) Safety and Risk Control; 2) Management Support for Safety; 3) Risk Perception; 4) Productivity and Supervisory Conflicts.

The items loaded on factor one relate to positive management actions and attitudes, including controlling recognised risks, being interested in worker safety, caring, reducing risk and coming down hard on safety. Also loading on factor one are two items relating to communications with immediate management (supervisor) and fellow workers. Factor two loaded with five items relating to management support for safety and one item relating to the likelihood of experiencing an accident. Factor three loaded with items relating to dangers and dangerous practices including foreman pressure to work unsafely and following their safety instructions loaded with perceived danger, the chance of having an accident, and perception that the site is dangerous.



Factor four loaded with three negative safety items, including serious safety problems in work, productivity coming before safety and rushing work.

**Table 8.10 UMIST Safety Climate Scale - Factor Analysis of British Sample**  
(n = 94) (Varimax rotated four factor solution - paraphrased items)

<b>Factor 1 Safety and risk control</b>	
<i>Eigenvalue 7.8 (30% of variance) paraphrased items</i>	Loading
Managers quickly control risks (20)	.82
Managers interested in safety (1)	.74
Managers really care and reduce risk (16)	.67
Managers come down hard on safety (4)	.64
Safe workers talk to others (11)	.64
Forman thinks badly of unsafe behaviour (14)	.62
<b>Factor 2 Management support for safety</b>	
<i>Eigenvalue 2.56. (9.8%)</i>	Loading
Managers turn blind eye to safety (8)	-.78
Managers invest in safety (13)	.70
Managers adopts new safety ideas (19)	.65
Only a matter of time before an accident occurs (10)	-.62
Foreman criticises unsafe working (7)	.58
Managers know about safety problems (15)	.57
<b>Factor 3 Risk perception</b>	
<i>Eigenvalue 2.087 (8%)</i>	Loading
Foreman pressures unsafe working (6)	.77
Big chance of having an accident on site (17)	.69
Your job is dangerous (5)	.67
This site is comparatively dangerous (22)	.65
Action safety advice from foreman (26)	-.48
<b>Factor 4 Productivity and supervisory conflicts</b>	
<i>Eigenvalue 1.7 (6.5%)</i>	Loading
Productivity comes before safety (2)	-.65
Foreman encourages safety (3)	.63
Often asked to rush work (9)	.57
Safety problems are very serious (18)	.51

Several items loading on the factors derived from the British sample include negative features of safety climate, in contrast to the Caribbean sample which tends to identify positive safety climate factors, eg, workers informing the

foreman of safety hazards. The following items loaded on the factors identified from the British sample but did not load on the factors identified by the Caribbean sample: foreman pressure to work unsafely; foreman criticism; foreman instructions; and rushing work.

*Factor analysis of combined raw data from British and Caribbean samples*

The scree plot (Appendix 5.4) for the combined sample suggests a seven-factor model that explains 56% of the variance. However, because the sixth and seventh factors scored close to one, a five factor model is retained accounting for 47% of the total variance. The Bartlett test of sphericity was high at 1614.02 and the Kaiser-Meyer-Olkin Measure of sampling accuracy was good with a score of .71. *Varimax* rotation was achieved in 32 iterations. The factor labels are: 1) Management Support for Safety; 2) Safety and Risk Control; 3) Safety Conflicts; 4) Worker Communications; 5) Risk Perception

The first factor, management support for safety which accounts for 16 percent of the variance, contains items relating to worker's perceptions of managers safety related attitudes and behaviours (Table 8.11). Management coming down hard on safety issues, their interest in worker safety, and their investment to improve safety loaded with workers informing the foreman of hazards and the foreman thinking negatively about workers who behave dangerously. Factor two loads with three items relating to management's recognition and control of hazards, and their willingness to adopt new safety ideas. Factor three consists of four negative safety features, productivity coming before safety loaded with rushing, serious safety problems and management turning a blind eye to safety. Factor four loaded with two items relating to worker communications with fellow workers and reporting dangers, while factor five loaded with three items relating to workers risk perception.



Table 8.11 UMIST Safety Climate Scale - Factor Analysis of British and Caribbean samples combined

(n = 247 - Varimax rotated four factor solution; paraphrased items)

<b>Factor 1 Management support for safety</b>	
<i>Eigenvalue 4.2 (Explains 16.3% of variance) paraphrased item</i>	Loading
Managers interested in safety (1)	.73
Forman thinks badly of unsafe behaviour (14)	.71
Tell foreman about hazards (12)	.67
Managers invest in safety (13)	.62
Managers come down hard on safety (4)	.55
<b>Factor 2 Safety and risk control</b>	
<i>Eigenvalue 2.3 (11.4% )</i>	Loading
Managers quickly controls risks (20)	.71
Managers know about safety problems (15)	.59
Managers adopt new safety ideas (19)	.51
<b>Factor 3 Safety conflicts</b>	
<i>Eigenvalue 2.0 (7.7%)</i>	Loading
Managers turn a blind eye to safety (8)	.66
Safety problems very serious (18)	- .65
Productivity comes before safety (2)	.60
Often asked to rush work (9)	.55
<b>Factor 4 Worker communications</b>	
<i>Eigenvalue 1.64. Explains 6.3% of variance.</i>	Loading
Dangerous situations reported (24)	.76
Safe workers talk to others (11)	.68
<b>Factor 5 Risk perception</b>	
<i>Eigenvalue 1.394. Explains 5.4% of variance.</i>	Loading
This site is comparatively dangerous (22)	.79
There is a big chance of having an accident on site (17)	.68
Only a matter of time before an accident occurs (10)	.52

*Summary of the Results from the UMIST Safety Climate Attitude Scale*

A four factor model of safety climate emerges from this analysis highlighting the importance of the quality of safety management, the presence of negative factors, worker risk perception and communications. Workers in the Caribbean and Britain construction industries both perceive management attitudes and behaviours to be the most important factor influencing safety (Table 8.12). The Caribbean and combined samples highlight the importance

of communications as an issue in safety climate which did not emerge from British sample.

<b>Table 8.12 Summary of Factors Derived from UMIST Safety Climate Scale</b>			
	<b>Caribbean</b>	<b>British</b>	<b>Combined</b>
<b>Factor 1</b>	Safety and Risk Control	Safety and Risk Control	Management Support for Safety
<b>Factor 2</b>	Managing Operational Safety	Management Support for Safety	Safety and Risk Control
<b>Factor 3</b>	Negative Influences on Safety	Risk Perception	Safety Conflicts
<b>Factor 4</b>	Accident Probability	Productivity and Supervisory Conflicts	Worker Communications
<b>Factor 5</b>	Worker Communications		Risk Perception

Negative safety aspects emerge as the third most important factor by the Caribbean sample. Items loading on this factor include managers turning a blind eye to safety, productivity coming before safety, and a big chance of having an accident. The third factor emerging from the British sample of workers loaded with negative safety items concerned with rushing work, productivity coming before safety and safety problems being very serious. This corresponds with the findings of the mean results from this scale which showed that the British sample scored rushing and the chance of having an accident higher than did the Caribbean sample. Caribbean workers scored higher the items relating to risk perception.

### ***8.2.3 Leather's Construction Safety Attitude Scale***

Leather's construction safety attitude scale was designed to measure the importance of seven factors in shaping workplace attitudes to safety, namely: individual care and attention; the importance of experience in safety behaviour; bonus schemes; workmates' attitudes; the foreman; the employer; and risk taking. The original scale consisted of twelve items, six of which were negatively scored items. Two items relating to bonus schemes were removed from the scale because such schemes are rarely used in the Caribbean. The results produced by the Caribbean sample of 124 construction workers, were



compared with Leather's findings from his sample of 132 workers in Britain. Half of Leather's sample was from the private sector while 97% of the workers interviewed in the Caribbean were private sector workers. His sample of 124 workers, included 45 carpenters; 44 labourers; 18 bricklayers; 14 plumbers; five plasterers; and six other trades including scaffolders, painters and an electrician.

### *Caribbean Results*

Ninety-three percent of Caribbean construction workers interviewed agreed that safety was a matter of worker care and attention, 81% agreed that carelessness was the biggest cause of accidents, while 73% agreed that it was individual worker's decision to take risks. Over 75% thought that safety came with experience, 92% considered their work mates influence important, 84% thought that management attitudes were important and 58% thought that they were under pressure to follow the lead of the foreman on safety (Table 8.13). Only 38% considered safety reminders important and 22% thought that safety was more in the hands of managers than workers.

Comparing the results for the Caribbean sample with Leather's findings from his sample of British workers shows that both samples positively score items relating to the importance of worker care (items 1, 7), individual risk taking (item 6), experience (item 8), work-mates behaviour (item 10) and the employer's attitude (item 9). Both samples were positive, but less certain regarding being under pressure to follow the foreman on safety (item 4 (r)). The mean score results demonstrate that both samples have a positive sense of their own importance, the importance of management and their work-mates in influencing safety.

**Table 8.13 Leather's Attitude Scale: Mean Results - Caribbean and Britain**

ITEMS (in rank order) (r = reverse scored item)	Leather's British mean scores	Caribbean Mean Scores (n=124)	Std. Deviation	% agree or strongly agree
1) Safety is just a matter of people taking a little more care and thinking about what they are doing.	4.35	4.12	0.89	93
10) Your work mates have an important say in the degree of safety or danger in your job (r)	2.21	1.96	0.65	92
9) The employers attitude is important with regard to safety (r)	2.59	2.1	0.8	84
8) Safety is something you learn from your own experience of doing a job	3.63	3.93	0.94	82
7) Individual carelessness is the biggest cause of accidents	3.68	3.81	1.13	81
3) The more a man does a job the safer he becomes.	2.98	3.78	1.08	75
6) Its up to you if you take risks the job doesn't force you to.	3.18	3.74	0.99	73
4) You're always under pressure to follow the lead of your foreman on safety (r)	2.58	2.74	1.18	58
2) Doing the same job day after day you forget the dangers and need someone to remind you of them. (r)	2.17	3.29	1.23	38
5) Safety is more in manager's hands than your own (r)	2.41	3.64	1.34	22

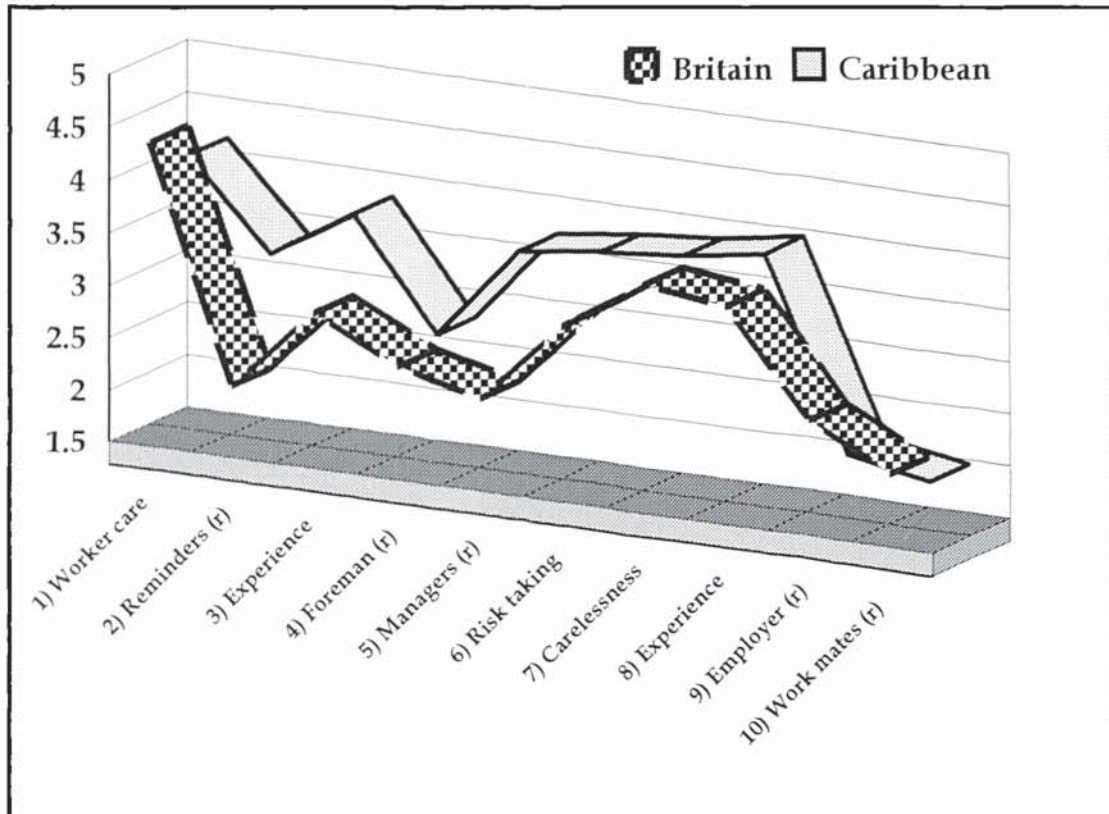
Caribbean workers produced a higher average score on items relating to the individual nature of risk taking, the importance of worker experience and the importance of management's attitudes, than the British sample. British workers scored higher the items relating to worker care and attention, safety reminders and safety being more in the managers' hands. Caribbean workers tended to disagree with the ideas that they needed continuous reminders regarding everyday risks and that safety is more in the hands of management.

Items 2 (safety reminders) and 5 (safety is more in the hands of management) are the points of greatest difference between the responses of the two samples. The majority of Caribbean workers felt that they did not need safety reminders because they were always aware of the dangers, many however, thought they would be useful. Their general disagreement with the statement safety is more



in the hands of managers than your own (item 5) reflects both a strong locus of control for safety, but also the general lack of safety management by Caribbean construction contractors.

**Figure 8.1 Comparison of British and Caribbean and Mean Results on Leather's Attitude Scale**



Worker attitudes in the Caribbean reflect a strong sense of locus of control over safety, but also the realisation that co-workers and managers are very important in ensuring safety. When scored positively, Leather's scale better reflects issues relevant to safety culture (Figure 8.1). The reversed items relating to following foreman, employer's attitude and work mates, while negative aspects of locus of control, can all be considered to be positive aspects of safety culture

#### **8.2.4 Leather's Attitude Scale: Caribbean Sample Factor Analysis**

Factor analysis of the Caribbean data collected on Leather's scale produced a four factor model (see scree plot - Appendix 5.1). The correlation matrix was neat and the same four factors were identified by the varimax (7 iterations) and oblique (16 iterations) rotations, but in different orders. All the items loaded on

one of the four factors identified which accounted for 65% of the explained variance. The Bartlett test of sphericity was 226.78, while the Kaiser-Meyer-Olkin Measure of sampling accuracy was 0.58, a mediocre but significant score.

**Table 8.14 Leather's attitude scale - Factor analysis of Caribbean sample**

<b>1) Individual care and management attitudes 23% of variance, Eigenvalue 2.3</b>		<b>Loadings</b>
Safety is about people taking care (1)		.83
Carelessness is the biggest cause of accidents (7)		.81
Your employer's attitude to safety is important (9, (r))		.72
<b>2) Risk taking and following foreman 17.6% of variance, Eigenvalue 1.76</b>		
Its up to you if you take risks (6)		.83
Under pressure to follow foreman's lead (4(r))		.60
<b>3) Experience 14% of variance, Eigenvalue 1.39</b>		
Safety is learnt from experience (8)		.81
Safety is learnt from experience (3)		.75
<b>4) External factors Explains 10.7% of variance, Eigenvalue 1.07</b>		
Safety is more in the hands of managers (5)		.83
Workmates affect your safety (10)		.61
Need reminders of dangers (2)		.40

The first three factors, accounting for 55% of variance, combine worker risk taking and experience with management related items, while the fourth item consists of external factors and accounts for only 11% of variance (Table 8.14). Leather's sample of British construction workers in the private sector scored the external factors (ie, safety being more in the hands of management, following the foreman and the influence of workmates), above personal care and risk taking. The loading of purely external items on the first two factors on the British private sector score may be indicative of a culture where management takes a stronger role in dictating site behaviour thereby reducing the influence of personal care and individual risk taking.



### *8.2.5 Hinze Site Safety Schedule*

The work environment is crucial in influencing the individual worker's safety performance. Hinze (1981) identifies both attitudinal and behavioural factors that characterise low accident rates, including: small working groups (seven or less); having a sense of enjoyment of working; good inter-worker relations; and no impossible deadlines imposed. His work was used as the basis for the production of an eleven item interview schedule which also considers factors such as frequency of work, accident experience and method of payment (Appendix 2.5). In contrast to the other scales used, the items score on simple three-point scales of numerical groupings, behavioural alternatives and attitudinal orientation.

This schedule was formulated after the fieldwork in Trinidad had been completed. All the 96 Caribbean workers interviewed stated that they got on well with their work-mates while 91% stated that they enjoyed working on site (Table 8.15). There was a strong sense of individual worker control over safety with 88% of the sample replying that themselves rather than the foremen or managers were responsible for their own safety. However, in Barbados only around half of the workers felt personal control over their own safety. Sixty-nine percent of Caribbean workers stated that they didn't feel rushed to finish off work, with the notable exception of the majority of Jamaican workers who felt that they sometimes had to rush their work.

Ninety-four workers from three different projects on the Jubilee Line Extension Project (JLEP) in London were interviewed on site during 1996. All the interviewees were volunteer, male, manual workers. Most workers stated that they personally had the most control over their safety and got on well with fellow workers. Less than a quarter of British workers stated that they discuss personal problems with their colleagues and less than a half stated that they enjoyed their work. Two-thirds felt that they experienced impossible deadlines and that they had to rush to finish off work.

**Table 8.15 Hinze Site Safety Schedule - Mean Results**  
*(Percentage Agreeing with Item Statement)*

	<b>Caribbean (n = 96)</b>	<b>British (n = 94)</b>
1) Work in groups of seven or less	69	82
2) Get on well with other workers	100	92
3) Enjoy work	91	43
4) Discuss personal problems with others	88	22
5) Don't compete with other workers	90	86
6) Work 12 months per year	67	80
7) Don't experience impossible deadlines	69	32
8) Don't need to rush to finish work	53	34
9) No accident in last five years	86	80
10) Paid by day rate	95	85
11) You have the most control over your safety	86	87

The results demonstrate that both groups of workers experienced good inter-worker relations and no sense of competition, felt they had the most control over their own safety, had little direct recent accident experience and were paid on a day rate basis. The main differences between the Caribbean and British samples were the:

- ♦ greater sense of enjoyment of work in the Caribbean;
- ♦ greater discussion between workers on site in the Caribbean; and
- ♦ greater sense of pressure from deadlines experienced in Britain.

When questioned regarding their thoughts on what were the key influences upon site safety culture in the Caribbean, most interviewees commented on the workers' aversion to risk. Common replies from project managers and construction company directors included:

- ♦ *the guys don't want to die, they enjoy life and don't take risks.*
- ♦ *man don't like pressure, and will walk off the job if he feels pressured.*
- ♦ *the men are jack of all trades, they are strong, and they don't cut corners.*



- ♦ *the extended family, social networks, and farming their own land takes the pressure off men to earn money all the time.*
- ♦ *the guys don't rush or take risks, and there is no sense of machismo.*

#### **8.2.6 UMIST Likelihood Attitude Scale**

The UMIST study team developed a safety attitude scale relating to the likelihood of an accident occurring in common hazardous situations found on construction sites. An abbreviated form of this scale was used in the Caribbean to assess people's perceptions of the risk attached to common situations found on construction sites. A total of ninety-one Caribbean workers, safety professionals and managers were interviewed using the UMIST Likelihood Attitude Scale (Appendix 2.4). The overall results obtained from this scale are considered disappointing, demonstrating a progression to the mean with average scores ranging between 5.4 and 5.0. The results from this scale are not considered reliable.

#### **8.2.7 Conclusions from Attitude Scales**

The commonality in safety climate factors between construction workers in Britain and the Caribbean samples is the most striking feature of the results obtained from the attitude scales utilised in this study. Factor analysis of the results from the UMIST and Leather's attitude scales demonstrate a number of common characteristics. Both samples saw safety as an interaction between managers and workers, with managers having the stronger influence reflected in the higher factor ranking of management dominated factors. Workers' perceptions of risk, experience, sense of rushing and safety communications were important but secondary factors of safety climate. The differences between the two samples' responses to specific items across the scales indicates differences in safety culture between the two samples. The Caribbean safety climate was generally more positive with respect to:

- ♦ locus of control - the importance of worker actions and experience;
- ♦ the importance of good interpersonal communications; and
- ♦ less sense of rushing work;

- ♦ enjoyment of work;
- ♦ greater risk perception allied with greater sense of control; and
- ♦ confidence in management.

The results of this study correspond, in part, with the findings of Dedobbeleer and Beland (1991) who found that construction workers perceived managers' attitudes and behaviours as one single dimension along with a second dimension consisting of workers' attitudes and behaviours. However, the results of this study suggest that other factors also play a consistent and important part in the safety climate of the construction industry in the Caribbean and Britain. The factor analysis of the attitude scales used in this study confirm the central importance of managers' and workers' safety-related attitudes and behaviours, but also demonstrate the issue of risk perception and cognition of negative safety factors. The different range of issues covered by the scale derived from the work of Hinze identifies the concepts of time, rushing and enjoyment as important dimensions of safety climate between two different societies.

Leather (1988) concluded that there was a general matrix of individual and organisational inputs that produced different attitudes between different sets of construction workers. Both public and private sector British construction workers as well as those interviewed in the Caribbean saw safety as a joint undertaking between self, co-workers and management. Caribbean workers rated highly their own skills and abilities to work safely, recognised the influence of organisational factors, avoided rushing and generally enjoyed work.



# ***Chapter Nine: Results - Organisational Factors***

This chapter summarises the findings relating to how construction contractors go about managing safety in Britain and the Caribbean. The following section describes the characteristic features of safety management practices in each culture. It brings together the findings collected during audits, interviews, discussions and experience of the industry. Appendix 3 provides details of the information gleaned country by country in the Caribbean.

## **9.1 Caribbean Construction Companies**

Information relating to safety management practices in the Caribbean was collected by a combination of semi-structured interviews, behavioural observation and literature review. Focused interviews with Caribbean company directors and project managers used the Construction Company Safety Management Interview Schedule as a prompt sheet (Appendix 2.6). The schedule consists of nineteen questions regarding the organisation of the company, its work and safety management practices. Sixty-one interviews with directors and project managers took place, primarily by face-to-face interviewing, however, several interviews in Jamaica took place over the telephone. Fifty Caribbean construction companies, eight British-owned companies, one Portuguese, one American/Moroccan company and a partnership between the Jamaican government and an Israeli construction company took part in this study. Table A3.16 (Appendix 3) summarises the details of the types of companies and projects examined.

### ***9.1.1 Procurement***

Traditional and construction management contracts were the most common procurement routes used in the Caribbean. Many jobs were run on a cost plus

basis and without strict time limits being imposed. One third of the projects visited were procured by the client using management contracting techniques. Management contracting was most common on works conducted by non-Caribbean companies in the more economically developed islands of Barbados, Jamaica, Trinidad and Saint Lucia. The client took an active role in many projects in the less economically developed states, for example in Guyana 75% of jobs were run by the client.

Most Caribbean commercial building projects used original or modified British Joint Contracts Tribunal (JCT 80) standard form of contract. Civil engineering projects tended to use the American FIDIC standard form of civil engineering contract documents. Non-relevant terms and conditions, eg, frost damage, were removed to adapt them for local conditions. Local derivatives of these documents were used as national standard forms of contract in Jamaica and Trinidad. The Caribbean construction industry rarely resorts to litigation to settle contractual disputes in direct contrast to the British situation described by Latham (1994). Only in Barbados did any of the contractors studied experience financial claims against them going to court.

The Caribbean construction industry in the early 1990s was generally in recession. IMF restructuring policies limited the available capital within most anglophone Caribbean countries. Skills shortages, an unreliable infrastructure and high rates of inflation caused great difficulties for the efficient running of the construction industry. The informal housing sector in the Caribbean is significant due to a shortage of low cost housing in the urban centres. Many areas of land marginal to housing and infrastructure developments are squatted and built upon.



### 9.1.2 Caribbean Construction Safety Management

Caribbean construction companies did not employ formal safety management techniques. Arrangements for safety management were rarely formalised and written down. There was an absence of safety management documentation, eg safety policies. The formulation of a safety policy was a requirement of the tendering process on only one contract: a hospital extension contract in Guyana financed by the Inter-American Development Bank. The Portuguese company that won the contract in Guyana as well as most British contractors and their Caribbean associates, had safety policy documents. Specific responsibilities for safety were, however, not assigned to specific company personnel. The majority of company directors stated that the foreman was ultimately responsible for safety on site. Only 20% (12) of the directors interviewed stated that they were ultimately responsible for safety, nine of whom came from Saint Lucia. The majority stated that the site supervisors were responsible for safety (Table 9.1).

**Table 9.1 Construction Companies Studied in the Caribbean**

<i>Countries</i>	<i>Number of Companies Studied</i>	<i>Number of Senior Managers Interviewed</i>	<i>Non-Caribbean Companies</i>	<i>Responsibility for safety as defined by Directors</i>
Anguilla	3	3	1 US\ Moroccan 1 British	Foremen
Barbados	9	12	1 British	Foremen, Site and Project Managers
Guyana	8	8	1 Portuguese 1 British Sub Con	Project Managers
Jamaica	12	10	1 British	Foremen and Site Managers
Saint Lucia	10	10	1 British	Foremen and Directors
Saint Vincent	8	9	2 British	Foremen
Trinidad and Tobago	10	9	1 British	Site and Project Managers
<i>Totals</i>	<i>60</i>	<i>61</i>	<i>10</i>	

The majority of Caribbean construction company directors stated that they reported accidents to the National Insurance Scheme (NIS) so that the injured

could claim sickness benefits, but did not report accidents to the Labour Department under occupational health and safety legislation. A minority of directors admitted ignoring the government systems, not reporting accidents and paying workers' medical bills and wages themselves. None of the Caribbean directors interviewed stated that they took occupational health and safety legislation or international standards into consideration when tendering for works, or priced for safety items in their tender bids. Safety legislation relating to construction site safety existed in Guyana and Jamaica in the form of comprehensive regulations, and in Trinidad in the form of a Protective Order regarding excavation works. This legislation was not enforced through court action and only in Jamaica was there a recent history of regular visits by inspectors to construction sites.

There was a general absence of formal health and safety training specific to the construction industry in the Caribbean. Only engineers trained at the Civil Engineering Department at the Saint Augustine campus of the University of the West Indies and foreign trained project managers had received construction specific health and safety training. However, outside the construction industry, the government and trade union colleges, some employers' federations and ILO schemes (eg, HEART in Jamaica), had safety components in their training courses. There was no equivalent of the British Construction Industry Training Board (CITB) in the Caribbean.

Most of the construction projects studied experienced delays due to design changes and materials supply problems. In a study in Trinidad, clients were found to be responsible for 50% of contract delays, consultants for 20% and contractors for 30% (Lewis and Mugishagwe, 1993). Contractors were generally dissatisfied with consultants and 80% of contractors experienced contractual problems relating to poor briefs, drawings and specifications. Directors and project managers stated that the ratio of the cost of labour compared with the cost of materials for most works studied was 1:2.



When questioned regarding the actions they would take to ensure that projects came in on time and on budget, Caribbean directors and project managers stated that they would increase the number of workers on site to increase productivity, rather than putting more pressure on existing workers. Competition between gangs of workers was not encouraged and only two bonus schemes were encountered. Both of the bonus schemes encountered were instituted by European contractors and were abandoned after a few weeks because they were not effective.

Most workers were paid weekly on a day rate, which varied according to trade. Specific job rates were common for extensive masonry and carpentry work. Workers on job rates stated that they did not speed up work to earn more money, but worked longer hours instead. If they did not feel like working on any particular day, workers would often not bother to turn up to site for a week or two. Particularly in rural areas, they commonly work on a construction site for several weeks and then go missing for a week or two to enjoy the fruits of their labour, or work on their own houses or farmlands.

Directors, managers and foremen stated that there were good relations on site between workmen and site managers. Caribbean managers often stressed the importance of open communications and the need to consult with workers. Site relations tended to be more paternalistic on Caribbean sites, with less emphasis on efficiency and speed. Most of the foreman interviewed on site were experienced and dedicated men, who treated their workers with respect and had an almost paternalistic attitude towards them. Caribbean workers tend to resist pressure, regulation and control. Both foremen and managers across the Caribbean stated that you had to get the respect of the workers in order to get them to work hard and that workers do not like pressure and will walk off the job if shouted at or pressed to work faster or harder. A Guyanese manager stated:

*The guys are very innovative, they need minimum supervision and like learning new things. You have to know how to deal with people in order to apply pressure. You can't just be blunt and direct, you need to be tactful and get their respect.*

This humanistic management style view was often repeated in interviews with construction managers and directors in the Caribbean. However, not all managers had such views and the *colonial style of leadership* was also evident. The colonial management style was not found to be as common as the literature review suggests, but that it was still a feature of the Caribbean work environment. Approximately a quarter of construction managers and company directors espoused values characteristic of the colonial management style. In Guyana a company director stated:

*I am a dictator when it comes to managing men, you cannot compromise, and labour is easy to get. I have sacked whole gangs of men for not working overtime when I wanted and brought in a new gang next day.*

The health and safety consultant for the Guyanese TUC, stated:

*Workers have a lot of interest in health and safety as they have concern for protecting themselves. They are enthusiastic to learn. Employers are only just becoming aware of the importance of health and safety, and still place most emphasis on profit and production. One major problem is poor management attitudes with a hasty management style and slave master mentality, massa day not really done.*

Project managers in the Caribbean who had experience of both cultures stressed the slower pace of work compared with British industry. Project lengths were longer in the Caribbean than in Britain. In the Caribbean there was a lower level of pressure on the workers and a slower pace of working. Construction managers with experience of both cultures stated that works of similar sizes would take approximately twice as long in the Caribbean generally and three times as long in SVG, compared with Britain. There were many reasons for the longer project length in the Caribbean including:

- ♦ materials shortages due to supply difficulties;
- ♦ decision changes by clients and architects;
- ♦ lack of finance;
- ♦ climatic influences;
- ♦ worker attitudes;
- ♦ working practices.



On one site an English company constructed several large concrete silos by slip forming. The Trinidadian site manager expressed the view that British employees worked at a greater speed than Trinidadians, and as a result the accident rate of British workers was higher. He also stated that the stripping down of the flying form on completion of each silo would have taken up to three weeks if carried out by Trinidadians. The English firm carried out this operation within one week. However, during one of the dismantling phases the British foreman tried to release a jammed part of the structure by kicking it away. As he did this, the part gave way and as the crane took the load it jerked him off the platform that he was standing on. He was fortunate that one of the Trinidadians was quick enough to grab him and save him from falling off the silo.

Managers and directors with experience of working both in Britain and the Caribbean considered that labourers in the Caribbean tended to be better workers, but tradesmen were not as skilled as their British counterparts. They stated that construction standards were better in Britain because the building process is more regulated and controlled. Emphasis was also placed on the lack of life pressures compared with more developed countries. In the Caribbean the physical hazards presented by the lack of fall protection, poor machinery guarding and PPE provision, are mediated to an extent by risk aversion, pace of work, resistance to pressure, and enjoyment of work and life.

A British project manager in Trinidad stated:

*Works look dangerous because there are very few physical precautions taken. The men seem more aware of what they are the doing and the potential dangers. They don't expect any safety barriers or other equipment and therefore look after themselves. You cannot pressure the men to work faster.*

A Portuguese site manager in Guyana stated:

*Workers here are very keen to learn new skills, but generally you don't get specialist craftsmen. Climate is important in dictating the pace of work. People don't like pressure and will walk off the job. African-Caribbean workers enjoy life and say that white men work to pay bills while black men work to enjoy life.*

## 9.2 British construction company safety culture

Information relating to British construction company safety management practices was collected by a combination of semi-structured interviews, behavioural observation, auditing and literature review. Descriptions of the safety management practices characteristic of the wider construction industry are based on information gleaned from the literature and over a decade of personal experience. The safety management systems (SMS) of contractors employed on the Jubilee Line Extension Project are described using information from auditing and general observation.

### 9.2.1 Safety Management Audit - Jubilee Project Line Extension

Examination of the SMS operated on selected JLEP contracts involved reviewing the site safety plans, observing and auditing on-site procedures, and interviewing key players to capture both formal and informal aspects of the SMS (see Appendix 2.1.2 for audit questionnaire). Following the HSG65 model of safety management, four aspects of the safety management system were examined:

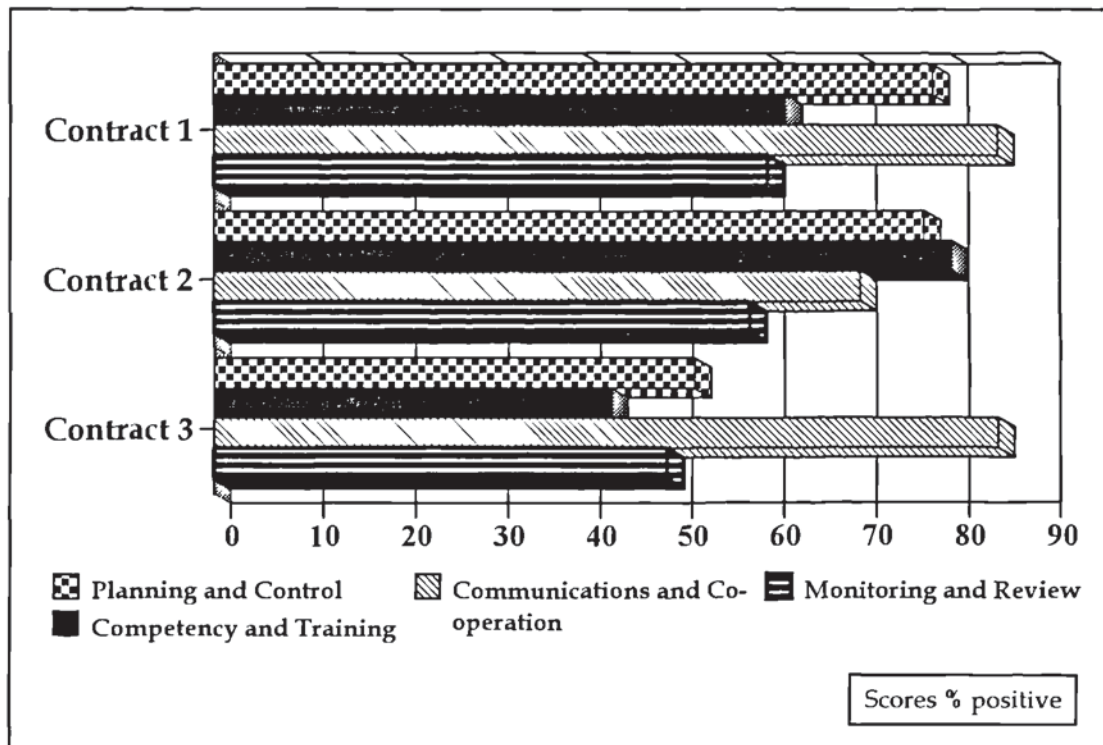
- ♦ planning and control;
- ♦ competency and training;
- ♦ communications and co-operation;
- ♦ monitoring and review.

The production of risk assessments, method statements and site specific safety plans were contractual requirements imposed and vetted by the JLEP project management team. All the joint ventures documented their safety management systems and procedures in a Site Safety Plan. Two of the joint ventures (JV) produced contract specific safety management systems in house, while the third contracted safety consultants to produce one for them. The systems developed in-house achieved higher safety management audit scores than that produced by consultants.



The two JVs that produced their own SMS scored over 70% on the SMS audits. Scores of positive safety performance for individual categories ranged between 60 and 85%. Scores of around 80% were recorded for planning and control, competency and training and communications and co-operation (Figure 9.1). Monitoring and reviewing safety performance was the lowest scoring category, with 60% positive safety performance.

Figure 9.1 SMS Audit scores for JLEP Contracts.



#### *Planning and control*

The SMS of the two best performing joint ventures were robust systems scoring 77% and 78% for this category. The site management teams were staffed by experienced individuals linked by clear lines of command. However, while individuals within the management team were aware of their safety responsibilities, specific duties were not detailed in job descriptions. A majority of procedures defined in the SMS were followed on site. However, a number of situations were identified where the procedures detailed in the SMS were not followed due to a lack of work planning, the partial implementation of procedures and a lack of senior management commitment.

Variations from the systems detailed in the Safety Plan included errors of commission where procedures followed differed from those defined in the SMS (eg, for the recording of atmospheric monitoring results), and errors of omission where key aspects of effective safety management were not instituted. These included habitual failures by senior site managers to conduct safety inspections, to communicate the importance of safety to all employed on the projects, and failure to detail safe systems of work for particular tasks. Procedures for planning and controlling work activities using risk assessments and method statements were generally followed primarily because they were driven by the client's own SMS. However, there was little proactive standard setting and auditing in relation to health and safety performance by contractors, which combined with a lack of commitment displayed by some managers and the perception of time pressures, resulted in unsafe work scenarios on all sites.

#### *Competency and training*

The collective experience within the management teams on site was extensive and there were a number of positive elements in the training systems operating on the projects. This category of the audit achieved an average score of 60% positive safety performance, with scores ranging between 43% and 80%. Many individuals had attended one day safety updates from their parent companies. However, a number stated that they felt that they were left out of their parent companies training schemes because they were in joint ventures. Many people identified areas where further training would benefit them, including general construction safety management, health and safety issues in tunnelling, practical risk reduction techniques and safety legislation. The provision and effectiveness of induction training, tool box talks and checks on certificates of training were variable across the contracts studied. However, untrained workers still drove plant and used dangerous equipment such as Hilti-guns and angle-grinders, without appropriate training and certification.



*Communications and co-operation*

Communications within management teams were generally good, and there appeared to be little difficulty in gaining appropriate health and safety information from the respective site safety teams. These high standards produced an average score of 80% for this category. However, only on one contract were workers able to express their views and concerns to through suggestion boxes and safety circles. Communications were frequently strained on site with problems experienced in getting relevant health and safety information across to site workers and obtaining feedback from them.

*Monitoring and review*

With an average score of 55%, this was the lowest scoring category in the audit of the SMSs. A great deal of effort was spent ensuring that incidents were properly investigated and reported as the client required contractors to use accident and incident rates as key indicators of health and safety performance. However, proactive measures of health and safety were rare. The client conducted a programme of safety auditing, using the results to try and motivate improved performance from the contractors. The contractors' safety plans specified regular safety audits, planned inspections and safety performance monitoring, but these were rarely carried out in practice. This reflects the culture of the industry that often takes only a reactive approach to the monitoring of health and safety performance.

*Summary of the findings of the SMS audits of JLEP contracts*

The result of the audits of the safety management systems of the JV contracts on the JLEP showed that safety management systems operated on site generally followed those detailed in the Safety Plans, where the plans were formulated in-house. The physical standards of site safety were very high at the time of the audit inspections. However, key proactive measures of safety were not followed and worker attitudes on site were often negative. The safety management systems employed on the JLEP were well above the norm for the British construction industry.

Audit scores for the JV that used consultants to prepare their SMS and Safety Plan (contract 3), were significantly lower in three of the four categories than the scores for the other contracts. The Safety Plan was a comprehensive document, but the systems and procedures detailed in it were often not implemented upon site. An overall audit score of 55% reflects a lack of fully instituted safety management systems on site. Scores of around 50% were recorded for planning and control, competency and training, and monitoring and reviewing. The communications and co-operation category of safety performance was the highest scoring category with a score of 70% positive performance. This safety plan was not a working document and did not reflect the systems operating on site.

### *9.2.2 Characteristics of British construction company safety management systems*

The diversity of construction companies is reflected in the diversity of their safety management systems. Large contractors tend to have well-established safety management procedures, safety departments and company safety advisors. Medium and small construction contractors, who dominate the industry, rarely have any formal safety management system. Civil engineering contractors tend to have more sophisticated and effective SMS than commercial building and housing contractors (Birchall and Finlayson, 1996).

Whittington, *et al.* (1992) found that the general approach to health and safety management of many organisations in the construction industry is reactive with an emphasis on short-term solutions to health and safety problems rather than identification of deep rooted failures and institution of proactive measures. Safety is seen as a non-competitive cost, the responsibility for which can be passed on to other parties via contractual arrangements. There is a blame culture where main contractors blame subcontractors, subcontractors blame main contractors and both blame individual workers when accidents occur. Line managers consider that many of the safety problems of the industry stem from the unwillingness of the workforce to work safely,



reflecting the prevalent simplistic concept of accident causation. However, safe systems of work are often not implemented or maintained on construction sites due to:

- ♦ lack of knowledge and understanding;
- ♦ inadequate levels of supervision;
- ♦ time and financial pressures leading to short cuts;
- ♦ custom and practice.

Commitment to health and safety management in construction companies is fundamentally undermined by the perception that safety conflicts with production (Dawson, *et al.* 1988; Whittington, *et al.* 1992). Time and financial pressures restrict the amount of effort devoted by managers to planning, supervising and monitoring work. Reliance on subcontractors and a lack of skilled workers produce safety management problems for main contractors. The fragmented and complex work relationships created by extensive subcontracting result in confusion over health and safety responsibilities (Mayhew and Quinlan, 1997).

Health and safety training for managers, supervisors and workers is often lacking within the construction industry, particularly in smaller subcontracting firms. In most of the medium to small construction companies that dominate the industry, the director, or person identified as having final responsibility for health and safety often has no specialist knowledge or training in the subject (Dawson, *et al.* 1988). Their contribution to proactive health and safety management is often confined to occasional reminders to workers to look after themselves. Risk assessments and method statements are rarely made to ensure safe working methods are established and followed.

*In general, we found that management in smaller firms was both informal and unstructured; where health and safety was concerned it was primitive or non existent. Dawson et al, (1988) p113.*

Managers and supervisors expect little support from senior managers and directors if they stop work due to safety issues and consider that they have little personal control over factors that undermine safety performance (Whittington, *et al.* 1992). British construction contractors often fail to make explicit health and safety targets and fail monitor individual and contractor safety management performance, focusing instead on production related targets. Where safety performance is monitored it often relies solely on reactive accident statistics.

Site safety inspections tend to be superficial, hardware orientated, infrequent and not backed by appropriate feedback to workers or subcontractors. Where specialist safety advisors are employed by construction contractors, line managers often consider them to be the experts primarily responsible for safety management. However, safety advisors and safety departments often have few resources and little influence on an organisation's decision making processes. Conflict between site management and safety advisors is common due to the pressures of completion dates and financial parameters (Whittington, *et al.* 1992). The risk assessment process, communication of information and employee involvement are poor in many organisations (Birchall and Finlayson, 1996).

The management of occupational health issues is particularly poor in the construction industry, despite the numerous hazardous processes and substances encountered in the industry. Asbestos, chromates, dust, lead, noise, solvents and vibration are common health hazards faced by construction workers. These hazards are compounded by lifestyle issues associated with smoking, drinking, high cholesterol diets, the uncertain and transitory nature of employment and social class (Waterman, 1997). Few contractors or projects currently operate proactive occupational health management programmes.



### 9.2.3 Summary of safety management practices in Britain and the Caribbean

In comparison with British contractors, organisations in the Caribbean construction industry generally lacked formal health and safety management systems. However, in relation to the legal requirements and health and safety management standards adopted by much of British industry, British construction contractors are poor performers. With the exception of some of the major players in, there are clear areas for improvement in construction contractors' health and safety management systems in both Britain and the Caribbean. The negative safety management aspects identified in the study of the JLEP are symptomatic of much of the British and Caribbean construction industry. The health and safety related attitudes and behaviours of senior managers, the risk assessment and method statement process, safety monitoring, safety management competence and worker training can be improved in both cultures to reduce the injury toll of the industry.

The Caribbean construction industry is less adversarial, less pressurised and less regulated than British industry. The Caribbean construction industry is more labour intensive, with less use of mechanisation and less wastage due to economic pressures than in Britain. Interviewees with people with experience of both cultures considered that the tropical climate dictated a slower work pace in the Caribbean, that less pressure was applied by management to workers in the Caribbean and that there is less societal pressure to earn money compared with Britain. The absence of formal safety management systems was balanced to a degree by the strong locus of control for their safety exhibited by Caribbean workers who also tended to be risk averse. The importance to African-Caribbean workers of the values of freedom, love of life (*joie de vivre*) and social aspects of work were stressed by many interviewees when describing the important factors of construction site safety in the Caribbean. Those project managers and company directors who had experience of working both in the Caribbean and Britain stated:

- ♦ *everything takes twice as long in the Caribbean than it does in Britain.*

- ♦ *there are few specialist trades on site therefore you don't get the same kind of competition on Caribbean sites.*
- ♦ *site relations are generally better in the Caribbean than Britain.*



## *Chapter Ten: Societal Factors*

This study examines some of the important external influences on the safety culture of the construction industry. The following section provides a brief overview of the construction relevant occupational health and safety legislation, the role of government inspectors and influence of employers and employee organisations. Information is presented from personal experience and the relevant interview schedules (Appendix 2). A more detailed description of the relevant legislation is available from the author, but is omitted from this text to comply with word limits.

### **10.1 Occupational Health and Safety Regulation in the Caribbean**

With the exception of Anguilla, all the countries studied in the anglophone Caribbean have enacted occupational health and safety legislation and appointed inspectors. Factories acts written by visiting British Factory Inspectors, formed the basis of Caribbean colonial governments' health and safety legislation. Current occupational health and safety legislation varies between countries regarding differences in the date and scope of the original acts and the subsequent amendments made to them.

In Jamaica and Guyana Factory Acts were introduced in the 1940s which established factories registration schemes, and remain the principal Acts being amended over the years to include specific health and safety requirements. This contrasts with SVG where the original Factory and Machinery Regulations 1943 were not gazetted and therefore not in force when the Factories Ordinance (Cap 7) was enacted in 1957. More up to date occupational health and safety legislation, although often formulated, has only rarely been passed in Caribbean countries. In Trinidad and Tobago, for example, a broad scope act similar to the British Health and Safety at Work, etc. Act (1974), was put before

parliament in 1975. In 1992 the Act was stalled in the parliamentary process, and it was not until the late 1990s that it became law.

### 10.1.1 Construction Specific Legislation

The Governor General is generally empowered through existing Factory Acts to make regulations applicable to the construction industry in the anglophone Caribbean, however, only the three largest countries have done so.

Construction industry specific health and safety legislation is present in the form of comprehensive regulations only in Jamaica and Guyana, while in Trinidad and Tobago a Protective Measures Order is on the statute book relating solely to excavation works (Table 10.1). In countries without construction specific legislation, the primary occupational health and safety legislation often applies only in part to the construction industry. In Barbados the 1986 Factory Act requirements regarding machinery safety and lifting equipment apply to construction sites. In Saint Lucia the 1985 Factories Act applies regarding accident reporting, vehicle safety and fall prevention. In SVG the Factories Ordinance (1955) does not apply to the construction industry.

**Table 10.1 Primary Occupational Health and Safety Legislation  
Applicable to the Caribbean Construction Industry in 1992**

COUNTRY	(excludes accident and ill-health reporting legislation)
Anguilla	None
Barbados	The Factories Act 1984
Guyana	Factories Law Cap 30 1977 The Building (Safety) Regulations 1955
Jamaica	Factory Act Volume IV 1973 The Building Operations and Works of Engineering - Construction (Safety, Health and Welfare) Regulations 1968
St. Lucia	Employees (Occupational Health and Safety) Act 1985 Factory Regulations 1948
St. Vincent	None ( <i>Factories Ordinance 1955</i> - not applicable)
Trinidad and Tobago	Factories Act 1948 amended 1969: Protective Measures Order 1977 (re: excavation safety).

Specific definitions of building operations differ from country to country in minor detail. However, building operations are generally defined as:



*construction, alteration or maintenance of a building including re-pointing, decoration and cleaning, demolition and the construction of foundations. Engineering construction is generally defined as the construction of railways, docks, harbours, tunnels, bridges, viaducts, waterways, reservoirs, pipelines, aqueducts, sewers, sewerage works, gas holders, oil tanks, roads and footpaths. The construction specific regulations in Guyana and Jamaica cover, inter alia, safe access, demolition, excavation, first aid, health, lifting, scaffolding, transport and welfare. The requirements follow the site specific proscriptive British construction health and safety regulations of the 1960's.*

Contractors are required to notify the Factory Inspectorate of all works expected to last longer than six weeks in Guyana, Jamaica and Trinidad and Tobago. Accident reporting requirements varied from country to country in relation to number of days absence from one in Guyana, to two in Jamaica and three in other Caribbean countries. A common condition in Caribbean construction safety legislation is that no regulation or Magistrate's Order is to *interfere with the design of any works or method specified by the consulting engineer if the method is not inconsistent with the safety of works or persons employed.*

#### **10.1.2 Inspection and Enforcement**

In 1992 there were approximately 25 inspectors with the remit for occupational health and safety legislation across the seven Caribbean countries studied. In Jamaica, Barbados, Guyana and Trinidad and Tobago there were specialist occupational health and safety inspectors. However, in the smaller islands labour inspectors were responsible for administration of employment law as well as occupational health and safety law. In Guyana inspectors were responsible for all work premises, not just factories. Inspectors undertook visits to workplaces to carry out preventive inspections, check on compliance, provide advice, investigate accidents and target particular hazards. Inspectors were allocated work responsibilities based on geographical location and/or industrial specialism. Inspectors had to make every effort to gain voluntary

compliance with the relevant health and safety legislation, due to a lack of legal powers.

The frequency of inspection of industrial premises was often based on risk, however, financial constraints often limited the amount of time that inspectors spent inspecting work sites. In Jamaica inspections were suspended for several months before the 1993 general election, due to financial restrictions. The construction industry was not regularly inspected as evidenced by the fact that none of the companies visited by the researcher had been inspected by a government health and safety inspector in the previous five years. However, inspectors were specifically assigned to inspect the construction industry in Jamaica and Trinidad and Tobago.

Entry requirements for trainee inspectors varied from the general civil service entry requirements to the possession of a diploma in Jamaica and a degree in Barbados. Inspectors were often sent to academic institutions in UK (including Aston University) or the USA to receive occupational health and safety training. Inspectors had similar powers to British Factory Inspectors being entitled to gain access to premises, examine documents and take samples and statements. None of the Caribbean countries, however, had given their inspectors the power to issue prohibition or improvement notices.

During inspections more emphasis was generally placed on welfare matters than upon machinery guarding. Inspectors paid particular attention to the provision of canteen, washing and toilet facilities. Inspectors often used checklists, based on ILO forms, during inspections. Both scientific and administrative equipment was, where present, often old and in need of maintenance. Computers were rare and little use was made of information technology. Falls, 'struck by' and trips were considered to be the most common causes of accidents. The underreporting of occupational accidents and ill-health were recognised as a significant problems.



Formal enforcement of health and safety legislation was minimal in the Caribbean. The factors limiting legal action by Inspectors included a lack of legal powers of immediate prohibition to stop dangerous activities without recourse to a magistrate and the lack of autonomy and support in the institution of legal proceedings. Inspectors were able to present cases in court, but this was rare, due to practical difficulties experienced by inspectors in getting cases before the courts. Many inspectors expressed their frustration at not getting cases approved and the low level of fines imposed by magistrates for breaches of occupational health and safety legislation.

One contributory factor leading to the lack of legal enforcement of occupational health and safety legislation, is the use alternative methods of bringing pressure to bear on employers. A Labour Commissioner stated that "*Although Labour Law may not be used to penalise a defaulting employer, there are many ways to skin a cat, particularly in a small country*". Other government departments would apply pressure by, for example, the refusal of planning permission and work permits. The informal settlement of disputes and gaining compliance is a feature written into St Lucian law. While this system has certain benefits, including increased flexibility for the inspector, decreased paperwork and less protracted disputes, the system is potentially open to abuse and may undermine inspectors' status and credibility.

The lack of equipment, funds, training, vehicles; effective legal power to issue enforcement notices; unreliable infrastructure and presence of gunmen (particularly in Jamaica) on construction sites in urban areas all limit the impact of Caribbean inspectors. Inspectors often considered that many duty holders had little respect for their authority. Resources were often scarce because departmental budgets suffered cuts as inflation rose and government spending restrictions took effect. Government salaries were generally low in comparison with other skilled occupations. Occupational health and safety legislation and enforcement in the Region as a whole was a low priority on government agendas due to a combination of factors including: relative lack of economic

development; economic recession; and IMF imposed government spending restrictions.

The governments within the Region had to cope with effects of world recession, relative poverty, and International Monetary Fund adjustment programmes that effectively limited the role of the State within society. By the end of the 1980s, Jamaica was spending more than half of its foreign earnings paying off the national debt, Trinidad suffered a drop of a third in per capita GNP due to the OPEC oil pricing agreements and Guyana was the second poorest country in the western hemisphere (Kurlansky, 1992). The immediate problems of economic survival deflected attention away from the development of occupational health and safety legislation and inspection in the Region.

The violent nature of politics in Jamaica impinges on the construction industry. Stone (1985) gives the example of the International Seabed Authority building in downtown Kingston which was located in the constituency of an opposition member of parliament. Most of the construction jobs were allocated to the party faithful from the immediately adjacent constituency represented by the Prime Minister. Hostilities between these two communities led eventually to a feud and political violence in which several persons were killed. Whilst in Jamaica the author witnessed gun men coming on site demanding protection money. Many of the larger sites employed armed security guards. Whilst socialising with construction workers in the downtown areas of Kingston, they expressed the view that local people must be employed if there is work going on in their area, otherwise they would make sure the site had problems.

### *Summary*

Occupational health and safety legislation in the anglophone Caribbean ranges from specific Factories style legislation implemented in colonial times to general duties of care. Little legislation relates specifically to the construction industry with the notable exceptions of Guyana, Jamaica and Trinidad and Tobago. Construction sites are rarely inspected by government health and



safety inspectors and enforcement action is extremely rare. Inspectors are generally hampered by a lack of resources, legal power, equipment and training.

## **10.2 British Occupational Health and Safety Regulation**

The first piece of British occupational health and safety legislation was the 1802 Health and Morals of Apprentices Act. Over the last two-hundred years subsequent acts, regulations and orders have been passed to control the specific risks arising from the development of industrial technology and its failures. This history of expansion of occupational health and safety law has been punctuated by periodic revision and amalgamation into Factory Acts. Since the passing of the Health and Safety at Work, etc. Act 1974 (HSWA), the philosophy of legislation has changed from being proscriptive and hardware biased to being general and goal setting in nature. HSWA marks the move away from process specific, premise based factory act style legislation, to place general duties of care on those in employment relations, in all work situations. Two principles under lie the Health and Safety at Work, etc. Act 1974 which are collectively known as the *Robens Philosophy*. Firstly, the principle of self regulation, ie those who create the risks are in the best position to control them, and secondly that of workforce involvement in health and safety management.

### ***10.2.1 The Health and Safety at Work, etc. Act 1974***

The Health and Safety at Work, etc. Act 1974 is the principle piece of occupational health and safety law in Britain. HSWA places criminal liability on employers to ensure the health and safety of their employees and others who may be affected by their activities, so far as reasonably practicable. The widely applicable general duties of care are backed by legally enforceable, industry and hazard specific Approved Codes of Practise (ACoPs). The Act requires employers to produce safety policies setting out their safety management philosophy and arrangements, and makes provision for setting up joint safety committees with trade union representatives.

Under Section 20 of HSWA, inspectors have wide powers for collecting evidence, including entry into premises, to require individuals to give statements, right of police and specialist assistance and any other power necessary to carry the law into effect. The extent of these powers is currently being challenged under human rights legislation in the courts. Sections 21 to 24 of the Act give inspectors the power to issue notices prohibiting hazardous activities and requiring improvements to be made to meet legal requirements. Notices cannot impose requirements to buildings that exceed those set by the building regulations, and are subject to an appeals process. Maximum fines range from £5000 to £20,000 in the Magistrates courts and unlimited fines and up to two years imprisonment may be imposed upon indictment to the crown court. Inspectors are authorised to present their own cases in magistrates court proceedings via Section 39 of the Act..

HSWA aims to prevent accidents through the development of a positive safety culture where directors, managers and workers are all involved. Its introduction expanded the coverage of occupational health and safety legislation to include an estimated eight million new premises and twelve million new workers. In the six years following the introduction of HSWA, fewer people were killed and injured at work, both in absolute terms and relative to workforce size, industrial activity and other measures (Dawson, *et al.* 1988). This improvement was, to a great extent, attributed to the introduction of the Act, but other factors such as major economic recession and the demise of traditional heavy industries such as ship building, are also significant contributory factors.

Unfortunately this downward trend in accidents did not continue past 1981. More people were being killed or seriously injured in the manufacturing and construction industries by the middle of the 1980s than at the beginning of the decade (Dawson, *et al.* 1988). The reasons for the apparent failure of the HSWA in the 1980s lie in the cultural changes in Britain PLC. Anti-union legislation introduced by the Thatcher governments, the defeat of the miners strike, the



privatisation of state-owned industries, the philosophy of deregulation, the encouragement of small firms, the growth of self employment, and changes in taxation were all part of the restructuring of industrial Britain. The two central pillars of the *Robens Philosophy*, ie employee involvement and self- regulation by large employers, were severely shaken by these changes.

The transformation of occupational health and safety statutory provision produced by the HSWA 1974 has subsequently been eclipsed by the changes produced by the European Union (EU). The *Robens Philosophy* of a simple legal framework backed by specific guidance documents has been superseded by numerous sets of occupational health and safety regulations emanating from the EU. Despite a Conservative government committed to decreasing bureaucracy and legislative control, much new EU driven health and safety legislation was introduced, including: COSHH 1988; NAWR 1988; MHSW 1992, CDM 1994, CHSW 1996.

#### *10.2.2 The Management of Health and Safety at Work Regulations 1992 (MHSW)*

Commonly referred to as the *Management Regs*, MHSW aim at ensuring that safety is effectively managed by employers and the self-employed through risk assessment and quality management. The risk assessment process involves the identification of the hazards arising from work activities, assessment of the likelihood and nature of any harm arising and the subsequent removal or control of these risks. Employers need to look for the hazards in the job including, how it is done, where it is done and what equipment, materials and chemicals are used. The scope of the assessment should include anyone liable to be effected by their undertaking, ie, employees, the self-employed, employees of other companies working on the job, visitors and members of the public who may be in the area or outside the site.

Hazards should be removed completely where possible, by changing the job or process. If a hazard cannot be eliminated, then the risks that it presents should be controlled. Control measures should protect the majority of workers rather

than individuals, eg to prevent falls, guard rails that protect everyone in the area should be provided in preference to the use of harnesses that only protect the individuals wearing them. Employers need to institute effective management systems to manage safety, which essentially follow the same philosophy as quality management systems. They should follow the principles of effective health and safety management found, *inter alia*, in HSG 65 and BS8800.

RoSPA (1996) suggest that there is much anecdotal evidence to suggest that British industry has failed to fully grasp the key requirements of the MHSW 92 and BS8800. In a review of the implementation of the Management of Health and Safety at Work Regulations 1992 in the construction industry, Birchalls and Finlayson (1996) found that larger companies and organisations made more effort to comply with the regulations than smaller ones. Two distinct safety cultures were identified, the first where the main contractor took responsibility for training and monitoring health and safety of all operatives on site, the second where the main contractor expected subcontractors to conduct the training and monitoring of health and safety of their employees. Overall compliance with the regulations was better under the first culture; the attitude of the main contractor's site management health and safety had a direct impact on the quality of safety management on site. Birchalls and Finlayson (1996) found that:

- ♦ quality of safety management and procedures was highest on civil engineering sites and lowest on housing sites;
- ♦ management of health and safety was easier with fewer workers;
- ♦ site management did not see risk assessment as a tool for addressing training needs;
- ♦ knowledge of risk assessments was best on civil engineering projects;
- ♦ all main contractors believed they complied fully with the regulations,
- ♦ subcontractors rarely provided the necessary training and information to employees;



- ♦ employees' awareness of the regulations was generally poor;
- ♦ site management was directly responsible for implementing safety training on site,
- ♦ operatives knowledge of the emergency procedures was poor on all sites;
- ♦ subcontractors were poor at complying with the requirements for risk assessment and control;
- ♦ over half of respondents felt that safety management added cost but it did not improve value in the construction industry;
- ♦ all workers place heavy reliance upon experience as the basis of their safety and knowledge.

### *10.2.3 Construction Specific Legislation*

#### *The Construction (Design and Management) Regulations 1994*

The high proportion of industrial deaths, major injuries and ill-health within the construction industry across Europe prompted specific regulations controlling the construction industry. The Construction (Design and Management) Regulations 1994 (CDM) originate from the framework directive passed by the EC in 1989 to improve health and safety standards at work across Europe. The main aim of CDM is to influence the primary stages of the construction process. Unlike previous occupational health and safety legislation specific to construction based on physical site standards, these regulations place key duties on the client and designer before work starts upon site. CDM requires that health and safety is taken into account and managed throughout all stages of a project, from conception, design and planning through to site works and subsequent maintenance and repair. CDM affects everyone who takes part in the building and construction process, the client, the designers and the contractors.

CDM introduced new requirements for the preparation of health and safety documentation, requiring the production of a health and safety plan at both the

pre-tender and construction phase of the works, and the preparation of a final health and safety file to act as a user guide for the finished building. The pre-tender health and safety plan, prepared at the planning stage by the planning supervisor, should include a general description of the project, the time constraints, and details of risks to work people in the design. The plan needs to contain sufficient information for contractors to be able to demonstrate competency and adequacy of resources when tendering for the project.

The health and safety plan should be developed by the principal contractor for the construction phase of a project. The construction phase health and safety plan should set out arrangements for ensuring the health and safety of all who may be affected by construction work, and the arrangements for managing the work. The health and safety file produced at the end of the project should include as built drawings and plans, the construction methods and materials used, the structure's equipment and maintenance procedures, and the location of utilities and services.

The CDM regulations created a new function in the construction process with the title of Planning Supervisor (PS). The PS is essentially a planning and co-ordinating role to be played by a team or individual to advise on safety matters and co-ordinate the planning process from the design stage. The client should appoint the PS as soon as practical in the design process so as to influence the design with respect to health and safety. Practical examples of risk reduction in the design process include the elimination of fragile roof sheets, installation of permanent walkways and safe working platforms for access and cleaning. Designers should include details of temporary support systems where temporary instability is unavoidable in the design. The need for workers making connections at height should be designed out of structures by designing in pre-assembly at ground level and lifting points. Stairways and floors should be erected as the frame proceeds to provide safe access.



Structural designs should include guard-rails or similar devices to provide edge protection to working places.

The high rate of accidents, the poor quality of buildings and the high costs of construction are symptoms of deep rooted problems in the construction industry. The British construction industry is plagued by a lack of trust and money, which leads to the practice of passing of the risk buck to other parties via contract (Latham, 1994). The introduction of CDM widened the application of occupational health and safety legislation from site practices and construction company safety management, to include the procurement process. The CDM regulations aim to ensure the effective management of health and safety risks within the construction process is undertaken by all the players within the construction industry. The CDM Regulations are an important force in producing the wider cultural change in the construction industry advocated by Latham.

*The Construction (Health, Safety and Welfare) Regulations 1996*

The Construction (Health, Safety and Welfare) Regulations 1996 (CHSW) and CDM were made in response to annex 4 of the EU's Temporary and Mobile Worksites Directive. CHSW deals with the technical site requirements of annex 4, placing duties on those who control the way construction site work is carried out. CHSW regulations are goal setting in nature in contrast to the prescriptive approach of previous construction regulations. These regulations retain previously set site safety standards and incorporate new requirements for traffic management and fire prevention.

CHSW applies wherever there is construction work carried out by persons at work. The regulations require the provision and maintenance of safe places of work and safe access and egress. They include the requirement to take steps to prevent persons from entering unsafe places. Those working to make places safe, should be protected by the provision of safe systems of work. All potential falls should be prevented, irrespective of the height of the fall.

Physical safeguards, ie guard rails, need to be provided where ever practical. Nets, rope access, and fall arrest equipment may also be used for protecting against potential falls. Safety standards for fall protection measures are detailed in schedules one to four. Previously set standards were maintained, with the additional requirement to protect the gap between toe-boards and guard rails on working platforms.

#### *10.2.4 Inspection and Enforcement*

The Health and Safety Executive (HSE) implements and enforces occupational health and safety legislation in Britain. The HSE provides publicity, information, guidance, and advice on health and safety matters. They liaise with institutions and professional bodies to assess the impact of regulations over the long term. The HSE produces many publications detailing the regulations, approved codes of practice and guidance relating to the way in which duty holders should seek compliance with the law.

The cornerstone of HSE compliance strategies is the preventative inspection programme carried out by inspectors. However, alternative methods of reaching duties holders such as auditing, central approaches to multi-site companies, seminars and television advertising are increasingly being employed. In the early 1990s the HSE conducted around 160,000 inspections per year, 1865 convictions and issued 4452 Prohibition Notices , by the mid nineties this had dropped to just over 120,000 per year, 1443 convictions and issued 4452 Prohibition Notices. This reduction in outputs was associated with a ten percent reduction in staff years (from 4537 to 4151) and a ten percent increase in the average time spent on each inspection (HSC, 1996). A large quantity of new legislation was introduced in this period, and early retirement schemes removed many experienced inspectors from the organisation, creating increased training burdens on the remaining inspectors.



The Construction Sector National Interest Group is the lead body for operational construction health and safety issues within HSE, providing a link between HSE inspectors, policy and technology divisions and the construction industry. It is staffed by around ten inspectors who liaise between the various interested parties in the industry to gather intelligence, develop effective compliance strategies, set standards and monitor performance. It provides the secretariat to the tripartite Construction Industry Advisory Committee, chaired by the Chief Inspector of Construction.

#### *Inspection of the Construction Industry*

The numbers of inspectors assigned to the construction industry increased from 104 in 1991 to 136 in 1996. Twenty of the 136 inspectors were temporarily assigned to construction sector as part of the implementation plan for CDM. An average of 120 inspectors dealt with the construction industry in the mid-nineties who carried out around 30,000 inspections annually representing approximately a quarter of all HSE inspections. Construction inspectors issued around a half of all prohibition notices issued by HSE and conducted 27,433 construction site inspections in 1995/6, representing almost a quarter of the total number of HSE inspection visits (HSC, 1996). Construction inspectors issued nearly half of all Immediate Prohibition Notices issued and took more than a third of prosecutions conducted in 1995/6. The number of construction visits fell by almost a quarter from the previous year, reflecting a move towards more detailed, in-depth visits. Following the introduction of CDM and MHSW in particular, inspectors spent much time focusing on management issues and explaining new duties.

In the 1990s operational inspectors paid particular attention to the industry's implementation of CDM and CHSW, the risks from falls from height, demolition, asbestos, fire, transport, and the *Good Health is Good Business* campaign. Inspectors regularly visit asbestos works and asbestos contractors to assess compliance with the legislation. HSE placed advertisements in the national tabloids and trade press to alert workers and self-employed

contractors to the dangers of asbestos dust. Besides raising asbestos awareness among workers, HSE targeted workplace building owners and managers, giving them advice on how to be more proactive in managing the risks from asbestos materials in workplace buildings.

The first custodial sentence for offences under health and safety legislation, not suspended by the court, was imposed on a contractor at Bristol Crown Court on 23 January 1996. A company director was sentenced to three months in prison for a breach of the Asbestos (Licensing) Regulations and four breaches of the Control of Asbestos at Work Regulations. The conviction followed the partial demolition of a factory by the contractor who took no precautions to prevent the spread of asbestos.

Major projects inspected in the mid nineties included the Channel Tunnel, The Jubilee Line Extension Project and the Severn Bridge. HSE prosecuted all these projects for breaches of occupational health and safety legislation. Many campaigns were launched on specific hazards, such as a national roofwork campaign. Serious incidents such as the Heathrow tunnel collapse using the New Austrian Tunnelling Method (NATM), and the building collapse at Ashford prompted major investigations by HSE. The collapse of tunnels under construction in the Central Terminal Area at Heathrow Airport on 21st October 1994 had major safety and economic implications, resulting in the suspension of similar work on the JLEP.

The construction industry has generally responded well to the implementation of CDM, which echoed many of Latham's (1994) recommendations. Improvements have occurred in information exchange and the management of risk in construction projects. There was feedback that some in the industry exaggerated what CDM required leading to over-bureaucratisation of CDM by the industry, particularly in relation to health and safety plans and the assessment of competence. The four main criticisms levelled at CDM relate to



the detail contained in health and safety plans, the role of the planning supervisor, competency checks, and the cost of compliance.

## 10.3 Tripartism

### *10.3.1 Tripartism in the Caribbean*

Tripartism is an established feature of the legislative process for occupational health and safety matters in the Caribbean, although it is often informal and intermittent. Tripartite discussion between trade unions, employers' organisations and the government on occupational health and safety issues is an established feature of many of the countries studied. The Co-operative Republic of Guyana was the only Caribbean country that had active tripartite groups and had developed a national policy on occupational health and safety. In 1992 the Ministry of Labour, Human Services and Social Security in Guyana formed the National Advisory Council on Occupational Health and Safety (NACOSH), which produced a national health and safety policy in association with the Occupational Health and Safety Department. In general, however, the tripartite process in the Caribbean was stagnant. Formal bodies, such as the NACOSH in Barbados and the National Safety Council of Jamaica, were dormant in the early nineties. In the smaller states such as Saint Vincent and Anguilla there was no formal tripartite mechanism for considering occupational health and safety issues.

#### *Trade Unions*

Trade unionism has been a major political force in the anglophone Caribbean often spawning the first post-colonial leaders and governments. The popular civil unrest, fermented by the lack of political progress in post-emancipation Caribbean, spurred the growth of trade unionism. The first unions were formed by construction workers, amongst others, in Trinidad in 1897 and in Jamaica in 1898 (Tennessee, 1987). Following the end of the second world war, a strong anti-colonial movement developed based on middle class and working class unity. Trade unionism lay at the centre of this process. In all countries

with the exception of Trinidad and Tobago, trade union leaders became heads of state.

Compared with the power that they enjoyed in the 1960s, the trade union movement was in decline in the early 1990s due primarily to economic hardships experienced in the majority of Caribbean countries. The economic depression and IMF restructuring programmes experienced throughout the Region decreased the degree of political influence of trade unions. Trade unions were only active upon the largest Caribbean construction contracts and by standing agreement with the larger civil engineering and construction contractors. No unions specific to the construction industry were operating, despite the presence of up to 15 in Trinidad alone in the 1970s (Brady, 1988). Trade unions tended to be of a general nature covering many different trades and industries, eg the Barbados Workers Union and the Bustamante Trade Union in Jamaica. Blanket style rather than trade or process specific trades unions are common in the Caribbean due to a combination of factors including the relatively small numbers of workers and the absence of worker guilds.

Few of the construction workers interviewed were members of a union. Union officials commented that the union had problems organising construction workers. They described Caribbean work culture as co-operative and stated that industrialisation had only occurred since the 1960s and that people's knowledge of industrial health and safety was therefore poor. Safety representatives and safety committees were very rare in the construction industry in the Caribbean.

#### *Employers Organisations*

Employers organisations are a common feature in most Caribbean countries, however, few construction companies are members of them with the exception of the Master Builders Federation in Jamaica. The Employer's Consultative Association of Trinidad and Tobago provides training and conducts annual safety meetings with all employers. Despite the lack of formal tripartite



process for discussing occupational health and safety matters, Mrs Mahabir former director of the Employers Consultative Association of Trinidad and Tobago, stated that: *there is a strong spirit of tripartism in Trinidad and Tobago* (ILO, 1975). The ex-Chief Labour Officer for St Lucia was the head of the local employers' federation and advised companies on labour law matters. The organisation provided health and safety advice to its members.

The Consultative Association of Guyanese Industry (CAGI) had a membership of 60 companies, consisting predominantly of the largest companies operating in Guyana. No construction companies were members of this organisation. The safety manager of the local beer brewing company was the association's safety consultant and provided a safety module on all senior management courses, and represented CAGI on the Tripartite National Health and Safety Committee. Mr Yankana the president of CAGI considered that:

*There is a poor work ethos in Guyana where industry has been operating at only about 35 per cent capacity due to lack of foreign exchange, a lack of spare parts and materials and poor management. Many companies are still owned by single families which has meant a resistance to change, and the entrenchment of old attitudes about management.*

The International Labour Organisation (ILO) has had a major influence in the development of training for labour inspectors and trade unionists in the Region. The ILO's Caribbean Labour Advice Centre (CLAC), formally located in Barbados and currently residing in Trinidad and Tobago, was influential in raising the profile of health and safety within the Region. Inspectors in the Region commonly used checklists developed during training sessions with the ILO. In 1988 the ILO organised a conference in Jamaica for the Region's inspectors, which included contributions by a British Inspector from the Construction Industry National Interest Group of the HSE. In 1994 the CARICOM secretariat was looking at the preparation of a legislative code, in conjunction with the ILO, on health and safety for member states to follow to update their existing legislation.

### ***10.3.2 Tripartism in Britain***

Both trade unions and employers organisations have occupational health and safety departments that are active in the promotion of health and safety issues amongst their members. The principal trade unions involved in the construction industry are the Union of Construction Allied Trade and Technicians (UCATT), the Transport and General Workers Union (TGWU), the Amalgamated Union of Engineers, Electricians and Plumbers Trade Union (AUEEPTU), the General Municipal and Boilers Makers Union (GMBU). UCATT the largest union, had a membership of around million workers in 1990. Approximately a third of this membership was employed in the public sector. The TGWU is the second largest union with 200,000 members in building related activities. Many of the workers are not site construction workers but involved in the manufacture of building materials.

There are seven main employers bodies representing the British construction industry which reflect the fragmented nature of the industry (Clarke, 1999). The Construction Industry Board (CIB) provide strategic leadership, the Construction Industry Employers Council (CIEC) represents main contractors, the Construction Clients Forum (CFI) represents procurement bodies, while the Construction Industry Council (CIC) represents consultants and institutions. Health and safety training is primarily provided by the industry funded Construction Industry Training Board (CITB) and the Construction Health and Safety Group (CHSG). The Building and Allied Trades Joint Industrial Council (BATJIC) is a negotiating body representing the Federation of Master Builders and the TGWU.

#### *The Construction Industry Advisory Committee (CONIAC)*

The main tripartite forum for construction safety in Britain is the Construction Industry Advisory Committee (CONIAC) and its various working parties. CONIAC, chaired and serviced by the HSEs Construction National Interest Group, is made up of representatives from the major employer and trade union groups. CONIAC has been responsible for publishing guidance to the



construction industry, commissioning health and safety research and directing change in working practices including the education curriculum for designers and managers. There are strong ties between these organisations and the Construction Industry Training Board which is financed by an industry levy.

The role of CONIAC includes giving advice to the Health and Safety Commission on the protection of people at work and the protection of the public from hazards to health and safety arising from the building, civil engineering and engineering construction industries. CONIAC also provides advice and guidance to these industries, and looks to develop a strategy for improving standards of health and safety within the industry. In recent years the membership has expanded from being almost exclusively contractor and trade union based to include clients and designers, and products suppliers and plant manufacturers. CONIAC meets three times per year and has a number of specific working groups on specific subjects, who input to the main meetings. It has also identified areas in which improvements are needed within the industry including the training of professionals in health and safety matters, meeting the needs of small firms, and the management of asbestos in buildings. It directs research and provides advice and feedback to HSE on the implementation of new legislation.

#### **10.4 Summary of Results**

This research examines the safety culture of the construction industry in two distinctly different parts of the world. Commonality and difference exist between the two cultures at various levels of culture (Table 10.2). The most striking differences found in the attitudes of construction workers include the high sense of enjoyment of work, open communications between them and an elevated sense of risk perception of Caribbean workers in comparison with British workers. On site the high standards of housekeeping on Caribbean sites, but poor provision of protective equipment stand out, as does the lack of effective safety management systems in the majority of construction companies

in both cultures. Sites in the Caribbean tended to be tidy with little material wastage, scaffolds were commonly constructed from timber with incomplete boarding and lacking guard rails and toe-boards. In Britain metal scaffolds fitted with guard rails and toe-boards and appropriate ties, lacing and bracing, are commonly used for working at heights.

At the company level the most striking aspects of this analysis are the lack of safety management systems, training and bonus schemes in the Caribbean. The key aspects of British construction culture are the fierce time pressure experienced and the perception of managers that safety is a trade off against production. The client tended to be more involved with the construction process in the Caribbean than in Britain. Adversarial attitudes and adherence to schedules and contracts were a feature of the British construction industry. The British government and its agencies took a more active role in occupational health and safety both with legislation and inspection. Legal powers were minimal and rarely used in the Caribbean. The tripartite process was an established feature in both regions. Formal tripartism was active in Britain, while it tended to be a more informal and infrequent process in the Caribbean.

At the macro level the regions can be contrasted by climate, economic development, and power relations. There is commonality in the super structure (in the Marxist sense) of society due to the hegemonic position of Britain. Differences become more apparent at the base of the societies studied in relation to environment, resources, technology, techniques, attitudes and values. The African cultural heritage of the majority of the workforce in the Caribbean, the experience of slavery and colonialism, and current economic constraints account for some of the most significant points of contrast between the two cultures. The following chapter discusses these findings and proposes models of accident causation and safety culture derived from this work.



**Table 10.2 Construction Industry Safety Culture - Summary of Key Findings**

	CARIBBEAN	BRITAIN
	CONSTRUCTION WORKER ATTITUDES (RELATIVE)	
<i>locus of control</i>	high	low
<i>risk perception</i>	high	low
<i>communications</i>	high	low
<i>rushing (- factor)</i>	low	high
<i>concepts of work</i>	work to live: don't rely on job;	live to work; pressure to earn;
	CONSTRUCTION SITE BEHAVIOURS	
<i>housekeeping</i>	generally good	generally good
<i>ladders</i>	made on site - few accidents	manufactured - many accidents
<i>scaffolds</i>	made from timber, not used for storage of materials edge protection rare	made from metal often used for material storage edge protection generally good
<i>PPE</i>	poor	variable
<i>techniques</i>	Robust structures, limited use of technology	Often complex designs, common use of technology
	CONSTRUCTION ORGANISATIONS	
<i>bonus schemes</i>	rare	common
<i>safety management systems</i>	little proactive management; safety seen as site function for foreman and workers	variable - good on JLEP poor in small contractors, safety seen as a site function
<i>safety training</i>	rare	national schemes increasing
<i>pressures</i>	financial and material supplies lack of specialist skills	fierce finance and time pressures
<i>dispute resolution</i>	litigation is rare	frequent litigation
<i>project management</i>	contingency approach	Taylorist approach
	CONSTRUCTION INDUSTRY	
<i>adversity</i>	little	common
<i>legislation</i>	little	much
<i>inspectors</i>	few	many
<i>enforcement</i>	uncommon	common
<i>approach</i>	negotiation	rule based
<i>use of technology</i>	low	high
	SOCIETAL FACTORS	
<i>regulation</i>	little influence	large influence
<i>tripartism</i>	ad hoc tripartism	formal tripartism
<i>wealth</i>	poor countries	rich country
<i>climate</i>	tropical	temperate
	SOCIETAL FACTORS IDENTIFIED BY LITERATURE REVIEW AND EXPERIENCE	
<i>bias</i>	collective and fatalistic	individualistic and hierarchical
<i>focus</i>	spirituality	materialism
<i>time</i>	time synchronous	time sequential
<i>risk</i>	risk averse	risk taking
<i>values</i>	joie de vivre Anansi smartness	PWE bulldog spirit

## *Chapter Eleven: Discussion*

This chapter discusses the principal findings of this research relating to the safety culture of the construction industry in Britain and the Caribbean. It examines the influence of societal culture on industrial safety culture with reference to cross-cultural research and cultural theory. It proposes holistic models of accident causation and safety culture, and raises methodological issues and areas for future study.

### **11.1 Safety Culture in the Construction Industry**

The construction sector is an important part of the economy in most countries. However, it is commonly considered to be a dangerous, dirty, hard and unreliable industry. The death toll of the construction industry around the world is indicative of an inherent poor risk management culture. The construction industry produces 30% of fatal industrial accidents across the EU, yet employs only ten percent of the working population, while in the US it accounts for 20% of fatal accidents and only five percent of employment (MacKenzie, *et al.* 1999). Construction fatalities account for 30-40% of the overall total of industrial fatal accidents in Japan, 50% in Ireland and 25% in GB (Bomel, 2001). Fatal accident incidence rates (per 100,000) across the EU range from below ten in Britain and Germany to over 20 in France and Spain (Building, 2001). The fatality accident incidence rate in the South African construction industry was 53.5 in 1990 (Smallwood, 1996), and 87 in Hong Kong - ten times higher than the all-industry average (Tam and Chan, 1999). The probability of getting injured as a construction worker in Hong Kong is on average 5.8 times greater than other industrial occupations (Lo, 1996).

Many different types of organisations are involved in the construction process, as well as many different trades and specialisms. Leading clients include



national and local government, the utilities, industry, property developers and successful businesses. However, the vast majority of clients, are one-off or infrequent users of construction professionals and contractors. Developers and clients tend not to invest in the construction process to make it more efficient because they look to returns on the use of, rather than the production of, buildings as their source of profit. Professionally qualified architects, engineers and quantity surveyors carry out the majority of planning and design work on large scale projects, thereby excluding the input of contractors. The major contractors tend to be long established firms who monopolise large scale new build projects. Subcontractors tend to specialise in specific technological processes and traditional trades. The majority of maintenance, refurbishment and minor works are undertaken by small contractors.

The industry is prone to boom and bust cycles; under production and over capacity, intermittent work and climatic influences. The fragmented nature of the industry, one-off nature of many of its products, irregular nature of employment, and limited training and supervision are characteristic features of the industry. Casual work, cash-in-hand payments, tax evasion, fraud and theft are commonplace. The construction process involves hazardous activities such as working at height, manual handling, exposure to hazardous materials and the weather, demolition, frame erection, lifting operations, scaffolding and groundworks. The consequences of these negative characteristics of the safety culture of the construction industry are unnecessary financial and human loss. However, poor risk management does not have to be the norm in the construction industry.

*Casual work and poor working conditions are not inevitable consequences of building work but of the way that the actual physical process of building is organised and executed. Ball (1988) p15*

The findings of this study support the research hypothesis that the safety related attitudes, values, behaviours and situations of actors in the same industrial activity in different societies, have similarities and differences which define their respective safety cultures. Standards of construction site safety and

the nature of site risks vary between the anglophone Caribbean and Britain. Construction worker attitudes to safety related issues in the two regions have similarities and differences. Safety management practices of the large construction companies in the two regions differ significantly. The fragmentation between different organisations involved in the construction process and the various professions are common features. However, the high levels of adversity, competition and litigation in Britain are not repeated in the Caribbean. Health and safety law, regulation and tripartism differs between Britain and the Caribbean.

### *Hazard and Risk Inventory*

The risk inventory (Table 11.1) illustrates the extent of common hazard occurrence on construction sites in Britain and the Caribbean, and the relative risk associated with each hazard. There are fewer hazards present in the construction environment in the Caribbean because of the nature of projects and methods of construction, however, the hazards that do exist are generally less well controlled than in Britain. The Caribbean construction industry typically employs labour intensive traditional construction techniques. There is less use made of chemicals, plant and machinery in the Caribbean construction process than in Britain.

**Table 11.1 Hazard and Risk Inventory**

<b>HAZARDS</b>	<b>Caribbean</b>		<b>Britain</b>	
	<i>frequency of occurrence</i>	<i>probability of incident</i>	<i>frequency of occurrence</i>	<i>probability of incident</i>
<b>Falls from height</b>	High	Moderate	Moderate	High
<b>Plant and Machinery</b>	Low	Moderate	High	Moderate
<b>Lifting Equipment</b>	Low	Moderate	High	Low
<b>Chemicals</b>	Low	Moderate	High	Moderate
<b>Asbestos</b>	Low	Low	High	High
<b>Manual handling</b>	High	Moderate	High	Moderate

In Britain high-falls account for half of all construction fatalities, but for only around a quarter in the Caribbean, despite the almost total absence of edge



protection. Cooper (1998) highlights the influences of fear and anxiety, catastrophic beliefs, self-efficacy and social dynamics upon falls from height. The risk of high falls presented by unprotected edges and unsafe systems of work at height in the Caribbean was moderated by the relatively slow pace of work, low height of buildings, and worker fitness, agility, risk perception and sense of personal control over their safety. Bomel (2001) identify deficiencies with worker risk awareness, legal compliance, health and safety training, systems of work and poor organisational control as key factors which result in fatal fall accidents in Britain. The pressures to work fast and take short cuts, despite the relatively higher frequency of fall protection due to the greater use of guard rails and fall arrest systems, results in falls being a more significant problem in Britain.

Despite the less frequent use of plant and machinery in the Caribbean, poor standards of guarding and maintenance increase the risk associated with their use. Asbestos, a major killer in the British construction industry, is absent in the majority of Caribbean buildings. Asbestos cement roofing sheets can occasionally be found on industrial roofs, but asbestos insulation is rare. Manual handling is a common hazard in both cultures, however, safe systems of work predominantly rely on teamwork in the Caribbean and technology in Britain. Economic pressures promote good standards of housekeeping and the recycling of materials on Caribbean construction sites, eg nails are commonly straightened and reused.

There is a higher risk burden in the British construction industry compared to the Caribbean. There is also a greater degree of safety management by the larger contractors in the British construction industry which reduces and controls many of the risks involved in the process. This positive aspect of the safety culture is prompted, at least in part, to the long established system of standard setting, legislation and enforcement. However, the small contractors, who dominate the industry and account for the majority of fatal accidents

(Bomel, 2001), rarely have anything more than rudimentary safety management systems and a vague knowledge of the health and safety law.

#### *11.1.1 The Safety Culture of the British Construction Industry*

The British construction industry is a complex and fragmented industry whose activities extend around the globe. It produces many excellent buildings and structures, however, projects frequently over run time and cost schedules, do not meet user requirements, and fail to last as long as they should (Ball, 1988). Productivity in the British construction industry was 30% lower than most other European countries (EC, 1980, Financial Times, 1993; Atkin, 1995). Industry characteristics, include fierce competition, poor communications, little teamwork, contractual problems, litigation and poor safety management (Abeytunga, 1978; Latham, 1993). It has a macho culture where crisis management and conflict are commonplace and safety responsibilities are ignored (Latham, 1994).

*... there is still the macho belief that safety is for wimps. In Don't write CDM off Construction News, 7 February 1997*

At the site level practices such as piece-rates, production-related bonus schemes, tight time schedules, complex contractual relationships and long working hours, promote short cut taking and poor working conditions. On small sites, there is less contractual complexity, but also a lack of collective knowledge due to the limited numbers and experience of the people involved (Dawson, *et al*, 1988). Workers tend to believe that management are more concerned with getting the work done than managing safety. Frequent changes of employer and work site limits the development of trust, loyalty and the provision of training. Standards of site safety often depend on the attitudes and experience of line managers. Managers frequently consider worker carelessness to be the prime cause of accidents and that the best way to motivate operatives is through traditional scientific management techniques (Honey, 1996).



At the organisational level, characteristics of the industry include endemic risk taking, cut throat competition, priced based competitive tendering, low profit margins, penalty clauses and litigation. Risks are taken and the law broken to resolve conflicting time and cost pressures with the consent of supervisors and managers. Poor work planning creates hazards and conflicts for individuals on site. Complex contractual chains link many different firms each with their own skills, methods of work and particular financial and time pressures.

Fragmentation encourages each party to protect their own short-term interests. Priced-based competitive tendering, programme pressures and use of penalty clauses set up pressures that conflict with safety management (Leather, 1987).

At the industry level, those who design structures frequently failure to ensure that their designs can be constructed safely. Poor communications between designers, contractors and clients are common. There are numerous procurement routes, contract types and variations, and there tend to be strict deadlines with severe penalties imposed for failing to meet them. Whittington, *et al.* (1992) identify the following fundamental problems of the industry:

- ♦ time and financial pressures;
- ♦ poor design;
- ♦ poor equipment;
- ♦ inadequate safety skills and management training;
- ♦ poor communications;
- ♦ inadequate planning;
- ♦ reliance on subcontractors.

Clients have traditionally done little to influence the actual construction process except to monitor production rates, quality and cost. The traditional construction project management regime is one of external quality control for the client by the design engineers or architects. This system has induced contractors to rely on external quality control rather than producing their own internal systems. Poor quality, low productivity, low capital investment,

intermittent work, and low wages go hand in hand in a vicious circle in which workers, contractors, professionals, clients and consumers are trapped (CIRIA, 1991). Conflict is guaranteed when the client wishes to retain the right to change decisions at will without accepting additional costs, while the contractor sees changes as the opportunity to increase profits. The typical client response is to avoid risk and apportion blame, rather than apply quality management techniques due to their preoccupation with price. This is despite the fact that there is evidence to show that appropriate quality does not mean higher prices (Ball, 1988).

*Clients get the industry they deserve and are willing to pay for.... Nicholls (1997) p5*

The Jubilee Line Extension Project, driven by the client's adoption of the International Safety Rating System, had one of the best client based safety management systems of any large scale civil engineering projects in Britain in the 1990s. Despite the proactive and comprehensive nature of the client's safety management system, many of the construction contractors employed on the project struggled to get to grips with basic safety management practices. The British construction industry culture placed many obstacles in the way of generating a positive safety culture throughout the project.

Many contractors on the JLEP displayed a lack of knowledge and commitment to proactive safety management. There was often poor compliance with the detailed paper safety management systems and policies, little use of proactive safety measures such as audits, a lack of involvement of senior management in promoting safety, an inherent blame culture and problems controlling subcontract labour. Contractual conflict was common, mainly over time and money. In 1998 a leading American construction management company took over the management of the project to finish it before the new millennium. Despite contractual disputes, numerous delays, major technical difficulties, several HSE enforcement notices and prosecutions, and a number of serious accidents, the project achieved significantly lower accident rates than the industry average.



The characteristics of positive safety cultures align with many aspects of total quality management. At the organisational level, characteristics of positive safety cultures, include the belief in the prime importance of safety, risk elimination and control, humanistic values, empowerment, participation, team working, monitoring and training. The key negative characteristics of the British construction industry safety culture which emerge from this study are summarised in Table 11.2. Many of the characteristics of the British and Caribbean construction industry identified in this and other studies conflict with the essential characteristics of positive safety cultures.

**Table 11.2 Negative Characteristics of the British Construction Industry Safety Culture**

INDUSTRY LEVEL	ORGANISATION LEVEL	SITE LEVEL
<ul style="list-style-type: none"> <li>✘ frequent conflict and litigation</li> <li>✘ focus on cost</li> <li>✘ complex regulatory system</li> <li>✘ division between design and construction</li> <li>✘ mistrust and blame</li> <li>✘ shorttermism</li> <li>✘ absence of investment in the construction process</li> <li>✘ prevalence of subcontracting and risk avoidance</li> <li>✘ complex, fragmented relationships</li> <li>✘ lack of consideration of health and safety in design and planning</li> </ul>	<ul style="list-style-type: none"> <li>✘ domination by small companies with few resources</li> <li>✘ intense competition</li> <li>✘ stress</li> <li>✘ production related bonus schemes and piece-rates</li> <li>✘ safety seen as a site matter</li> <li>✘ limited safety management</li> <li>✘ safety thought to conflict with production</li> <li>✘ safety training limited but improving</li> <li>✘ regulations frequently ignored</li> <li>✘ limited monitoring and reviewing performance</li> <li>✘ poor organisational learning</li> </ul>	<ul style="list-style-type: none"> <li>✘ job insecurity</li> <li>✘ dangers taken for granted</li> <li>✘ risks not controlled</li> <li>✘ poor communications,</li> <li>✘ blame culture</li> <li>✘ tight deadlines, long hours, low pay, low productivity,</li> <li>✘ rush to complete work</li> <li>✘ risk taking</li> <li>✘ short cuts common</li> <li>✘ variable competence</li> <li>✘ lack of participative decision making</li> </ul>

Following Shilliton's (1995) typology, the safety culture of the British construction industry is a *rule book* orientated culture where safety management is poor and motivated more by the desire to comply with the legal rules and avoid prosecution, than to actively prevent loss. Workers are considered careless and are blamed and punished for mistakes and accidents. Training is scarce, scientific management styles prevail and many in the

industry believe that safety conflicts with productivity and profitability. Following Eckenfelder's (1997) typology, the safety culture of the construction industry is *immature*. At best, some of the larger contractors are at the *novice* stage of maturity, where efforts are made to integrate safety into the business goals, safety awareness is growing, safety management is sometimes proactive, but the empowerment and involvement of workers is limited. Many of the smaller contractors, which dominate the industry, are at *the darkness or ignorance stage* of safety culture maturity where safety is seen as a burden, safety management is purely reactive and safety performance measurement is absent.

#### *11.1.2 The Safety Culture of the Caribbean Construction Industry*

The Caribbean construction industry is an important part of the region's economy, consisting of private and public sector clients, design, management and construction specialists. Each country has a dozen or so major construction and civil engineering contractors, which include branches of international contractors. British contractors frequently operate within the anglophone Caribbean region. New build work dominates the Caribbean construction industry, as the development process continues.

Caribbean construction contractors had generally not instituted formal safety management practices and pay little regard to health and safety regulations. Like Britain, poor levels of safety training, job insecurity, hazardous working conditions and long work hours are features of the Caribbean construction industry culture. Subcontracting, poor quality management and the devolution of safety management to the site level are common to both cultures and are characteristic features of much of the construction industry around the world.

Lewis and Mugishagwe (1993) highlight the low pay, inadequate design briefs, drawings and specifications, poor motivation, low productivity and skills shortages in the Caribbean construction industry. Other factors highlighted



include shortages of materials, poor infrastructure, political influences on site planning and the effects of boom and bust cycles. Material supplies difficulties, currency value fluctuations, extreme weather conditions and unreliable infrastructures, dictate a contingency style approach to project management and a relaxed attitudes to time schedules. There is little recourse to the legal system to enforce health and safety or contractual law. At the site level workers do not experience situational drivers for speed and risk taking, with the virtual absence of production-related bonus schemes and little time pressure (Table 11.3). Workers have a strong sense of locus of control over safety, generally trusted management and looked out for each other.

**Table 11.3 Negative Characteristics in the Safety Culture of the Caribbean Construction Industry**

INDUSTRY LEVEL	ORGANISATIONAL LEVEL	SITE LEVEL
<ul style="list-style-type: none"> <li>✘ absence of investment in the construction process</li> <li>✘ few specific regulations relating to construction</li> <li>✘ lack of inspector enforcement powers,</li> <li>✘ little enforcement action</li> <li>✘ limited resources</li> <li>✘ limited use of technology</li> <li>✘ dormant tripartism</li> <li>✘ unreliable infrastructure</li> <li>✘ materials supply problems</li> <li>✘ lack of consideration of health and safety in design and planning</li> </ul>	<ul style="list-style-type: none"> <li>✘ domination by small companies with few resources</li> <li>✘ lack of formal safety management systems;</li> <li>✘ colonial management styles</li> <li>✘ few specialisms,</li> <li>✘ little training</li> <li>✘ few resources devoted to safety</li> <li>✘ skills shortages</li> <li>✘ safety seen as a site matter</li> <li>✘ legislation ignored (where present)</li> </ul>	<ul style="list-style-type: none"> <li>✘ job insecurity</li> <li>✘ long working hours</li> <li>✘ multi-skilling</li> <li>✘ poor provision of PPE</li> <li>✘ risks not controlled</li> <li>✘ little specialisation</li> <li>✘ variable competence</li> <li>✘ little safety training</li> <li>✘ plant and equipment poorly maintained</li> <li>✘ lack of participative decision making</li> </ul>

The safety culture of the Caribbean construction industry displays features of the *behavioural* safety culture following Shilliton's (1995) typology. Workers tend to accept responsibility for their own safety and do not rush to achieve production targets. However, at the organisational level safety is not actively managed. Following Eckenfelder's (1997) typology, the safety culture of the Caribbean construction industry is *immature* as safety management is reactive or absent, training is scarce, there are skills shortages and evidence of colonial

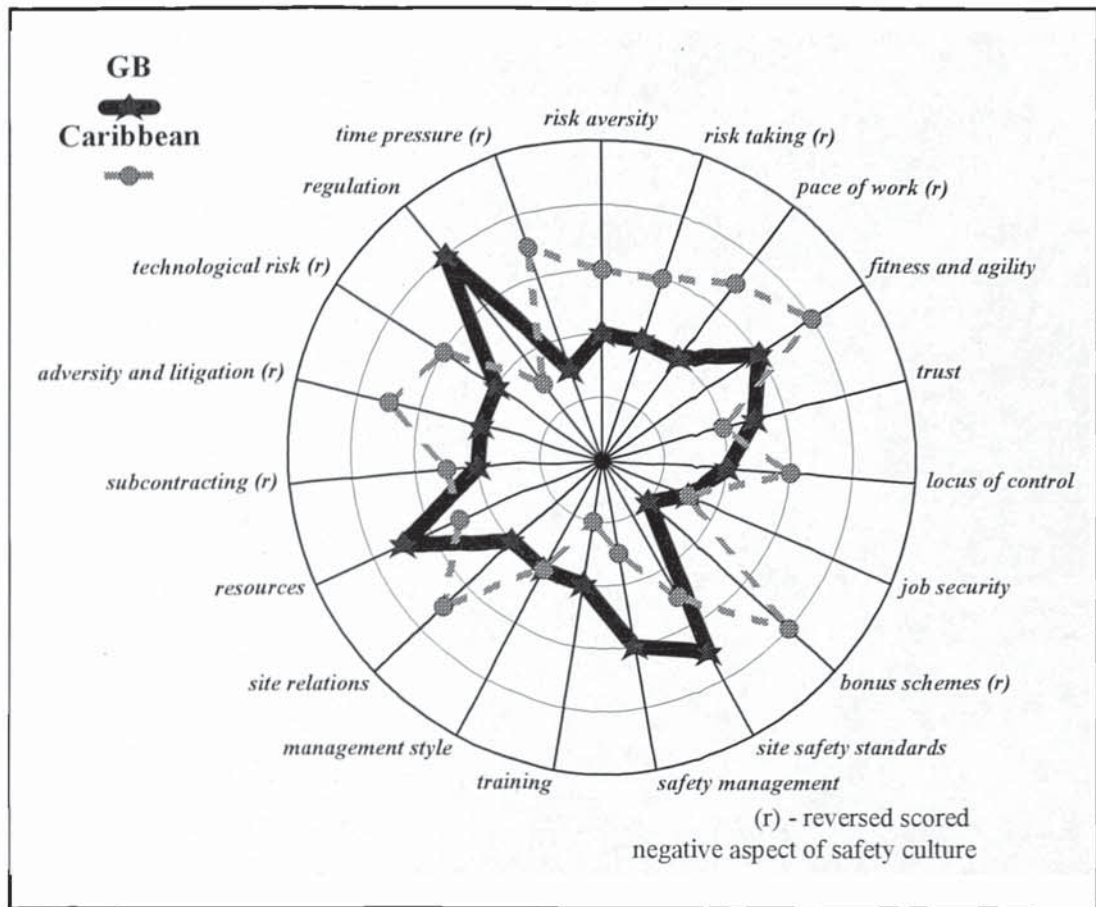
management styles. A prevalent attitude in the industry is the safety expenditure reduces profitability. There is little motivational influence exerted by government through legislation and inspection activities. The culture of the Caribbean construction industry is less adversarial, formal, pressured and regulated than the British construction industry. Those project managers and company directors who had experience of working both in the Caribbean and in Britain considered that site relations were better in the Caribbean, and projects take twice as long in the Caribbean compared with Britain.

### *11.1.3 Summary*

Comparative profiles of the two safety cultures can be built up combining the significant factors identified in this study. The radar map (Figure 11.1) provides a conceptual depiction of the safety culture of the construction industry in the Caribbean and Britain. The data points represent the key issues that emerge from this study. Personal factors such as risk taking and locus of control are positioned in the upper right hand third of the diagram. Construction industry factors such as site relations, training and safety management are located in the bottom third, while societal factors occupy the left hand third of the diagram. The data points are placed on a five-point scale rising from zero at the centre of the map. The relative magnitude of each data point is derived from the triangulated results of this study and personal observation. The further the point away from the centre of the map, the greater the positive influence of that factor.



**Figure 11.1 Radar Map of the Construction Safety Cultures of the Caribbean and Britain**



Characteristics common to both cultures are the relative lack of job security, trust and humanistic management styles. Compared with the Caribbean, the British construction industry is more positive in relation to regulation, resources, training and formal safety management. Negative influences within the British construction industry safety culture include adversity, complex subcontracting relationships, risk taking and rushing. British concepts of time and risk ensures that construction clients and contractors frequently focus too much on costs and progress at the expense of quality and safety, resulting in frequent accidents, disputes, litigation, poor quality and rushed work.

The Caribbean construction industry is more positive in relation to sense of locus of control, risk perception, work pace, fitness and agility. The Caribbean construction industry faces less technological risk due to the comparatively limited use of chemicals, plant and machinery; the relatively low height of

buildings and robust earthquake resistant designs; general absence of asbestos; and easy to handle design of concrete blocks. The Caribbean construction industry is less adversarial, not as mechanised, less pressurised and less regulated than is its British counterpart industry. Time is less of a pressure, production related bonus schemes are generally absent and work pace is relatively slow.

The tropical climate affects the designs of structures, choice of materials, work patterns, work pace and perceptions of time. African-Caribbean culture places emphasis on collectivity, spirituality and *joie de vivre*. Time is not money and people are prepared to take their time to do things. Both Caribbean and European construction professionals working in the Caribbean stated: *people live to work in the Britain, while in the Caribbean they work to live*. Fall protection is commonly lacking at the edges of structures, formwork and scaffolds in the Caribbean. The relatively slow pace of work, high level of worker agility, sense of locus of control over safety and risk are positive cultural factors which help explain the relative lack of falling accidents compared to Britain. Despite the common occurrence of unprotected drops, mediating cultural factors reduce the potential for falls, corresponding with Hinze's (1997) *Distractions Theory* and Leather's (1987) *PAS Model*.

## 11.2 Societal Impact on Safety Culture

*A major, although subtle, factor affecting the safety and performance of a technological system is the degree of compatibility between organisational culture and the national culture of the host country. Meshkati (1995) p264*

The fourth aim of this study was to identify the societal factors that impact upon the safety culture of construction industry in Britain and the Caribbean. The examination of the safety culture on an international level brings into focus those societal sources of influence upon safety culture which are often considered outside the scope of most studies of safety culture. The relative importance of the impact of the different levels of analysis of safety culture is important to establish to aid the understanding, prediction and control of



industrial risk (Reason, 1997). According to several studies, an operator's culturally-driven habit is a more potent predictor of behaviour than his or her intentions (Meshkati, 1995). However, current knowledge relating to the impact of societal factors on safety culture is limited due to the focus on organisational and individual factors.

Reason (1997) identifies individual, workplace, organisational and societal factors in the causation of major accidents. He speculates that of these different causative factors of accidents, organisational culture, processes and the workplace, are the key indicators of explanatory, predictive and remedial value. He ranks individual factors second to organisational factors, followed closely by regulation and society, to which he assigns little remedial value. The findings of this study of safety culture suggests that societal influences may be more important than envisaged by Reason. Cultural filters are key factors in the risk homeostasis model of accident causation (Adams, 1995). Cultural biases influence the way people perceive time, their environment, other people, desired behaviour, etc. They subtly influence individuals' cognition and behaviour and are therefore influential at each level of the safety culture vortex.

#### *11.2.1 Dimensions of Culture*

Hofstede's dimensions of cultural bias can be used to compare the biases inherent in British and Caribbean culture. Table 11.4 provides a conceptual visual representation of the relative biases of the two cultures identified in the literature and experienced during this study. Hofstede's sample contained an inadequate number of responses from Caribbean workers to be considered representative of the Caribbean as a whole. The author has therefore combined the factors highlighted in Hofstede's work and the findings of this study in order to indicate the location of Caribbean biases on this scale.

**Table 11.4 Schematic Representation of Cultural Bias Between Britain and the Caribbean (after Hofstede, 1980; 1994)**



Hofstede (1980) identifies British culture as biased towards low power distance with emphasis placed on the legal system, democratic power and technology. The Caribbean, despite the presence of factors associated with high power distances, is placed in the mid-ground of the power distance dimension, due to the influence of the British colonial experience. British culture is biased towards individualism in contrast to the collective bias of Caribbean societies.



The Caribbean bias towards collectivity corresponds with the situational factors of a warm climate, relative poverty and low technological development identified by Hofstede. Particularly in the rural Caribbean, the sense of community is strong, everybody knows everybody else. Alleyne (1988) refers to a sense of 'oneness' in Jamaican rural communities where each person's problems are shared by the community. There are no sharp divisions between the secular and the spiritual. The collective and time synchronous biases of Caribbean societies are reflected in Afrocentric paradigms and contrast sharply with the British biases towards individualism and perception of time as sequential.

How a culture conceives of time is fundamentally important to many attitudes and behaviours (Schein, 1985). The Afrocentric concept of time is based on natural events rather than imposed mathematical formulas; it is a phenomenal event. Time corresponds with the duration of an event, rather than the number of minutes. It does not matter how long it takes, the most important thing is participation in the event taking place (Nhiwatiwa, 1979 (quoted in Alleyne, 1988)). The concept of time being determined by events and participation in them has puzzled many outsiders who complain that Africans and African-Caribbeans do not keep time or just waste time sitting down doing nothing and seem lazy.

Life in the Caribbean is comparatively unhurried and there is relatively little importance attached to strict time keeping. In the construction industry this was reflected by time schedules not being assigned to many construction projects. Caribbean people generally do not experience anxiety or impatience when waiting, it is not important how long you spend at (say) the barber shop, what matters is the quality of social interaction. Freedom, spirituality, creativity and dignity permeate Caribbean society. Great value is placed on human life and children in Caribbean culture (Nettleford, 1989). Communication, style and immediate gratification are important (Alleyne, 1988). Life is not all about work, and is not divorced from social activity.

The individualistic bias of British colonists, the limited nature of social proscription in post slavery societies, the proximity and cultural penetration of the USA and urban living all serve to increase the strength of individualism in Caribbean societies. Alleyne (1988) describes this process as the confrontation of European individualism and traditional Jamaican collectivism. Caribbean people recognise the increasing influence of the USA in the region, a growing trend towards individuality and a breakdown in the sense of community over the last twenty years. Today the urban Caribbean, in particular, is feeling the tremendous pull of modernisation, the pressure to get rich quick and consume, creating a cultural rootlessness (Alleyne, 1988). The collectivist principle is, however, slow in dying. Drivers still stop at almost every opportunity to talk to friends they pass on the road.

The British individualistic and hierarchical bias promotes a blame centred, legalistic bias towards health and safety regulation and management. The perception of time as sequential and as a cost, ensures construction clients and contractors focus on time and cost, resulting in frequent disputes and litigation. The bias towards low uncertainty avoidance limits the detail of safety management systems and procedures in both cultures. Figure 11.2 illustrates the cultural bias of the two Regions, using the typology of cultural bias developed by Thompson, Ellis and Wildavsky (1990) as interactive system following Gabe (1995). Britain combines hierarchism with individualism, while the Caribbean combines egalitarianism with fatalism and individualism.



**Figure 11.2 Conceptual Map against Five Cultural Biases**  
(after Thompson, Ellis and Wildavsky, 1990)



Following Bandura's theory of social action, the influences and biases of the cultures of the two regions can be examined using the triadic situation, cognition and behaviour typology (Table 11.5). The factors in each category combine and interact in a variety of ways to form the cultural biases of each region.

**Table 11.5 Societal Cultural Biases in Britain and Caribbean**

	<b>Britain</b>	<b>Caribbean</b>
<b>Situation</b>	temperate climate industrialised technology dominates life former colonial power	tropical climate agricultural, industrialising nature dominates life former colonies
<b>Cognition</b>	universalistic, segmented dominate nature scientific knowledge inner-directed time sequential low uncertainty avoidance material wealth bull dog spirit	particularistic, holistic live with nature intuitive knowledge outer-directed time synchronous medium uncertainty avoidance joie de vivre Anansi smartness
<b>Behaviour</b>	individualistic, hierarchists competitive, assertive low power distance live to work fast pace of life	egalitarian, individualistic, fatalistic expressive medium power distance slow pace of life

The tropical environment dictates a relatively slow pace of life and work, and ensures that nature dominates life. The temperate climate of Britain dictates regular seasonal changes and fluctuations to work patterns, and encourages the use of technology to control nature and speed up life. Caribbean attitudes towards work are influenced by the colonial history, climate, availability, sense of self-worth, and the values of working to live not living to work and *joie de vivre*.

### ***11.2.2 Illustrations of the Impact of Societal Cultural Bias***

Preferred management styles have their roots in, and in turn, influence, national culture. The concepts of the US authors Deming regarding quality circles, and Scanlon on self managed groups, form the basis of TQM. Organisations in the USA generally rejected these ideas in favour of Taylorism in the first half of the twentieth century. Only after Japanese corporations prospered did US and European organisations consider employing TQM principles (Hampden-Turner and Trompenaars, 1993). The success of TQM in Japan is due, to a large degree, to its synergy with Japanese culture. Japanese culture is known for being collectivist as opposed to individualistic American culture (Hofstede, 1980). Japanese commentators consider Taylorism and scientific management are going to be the downfall of America because they ignore the ideas of the majority of workers within an organisation (Hampden-Turner and Trompenaars, 1993). Studies of safety culture in the nuclear industry have recently begun to consider the implications of national cultural factors for safety culture (Meshkati, 1995). It is apparent from this analysis that many of the problems of the British construction industry stem from biases in our national culture.

The bias towards individualism in the culture of the USA and Britain is demonstrated by fragmentation, litigiousness, short-termism, scientism, and standardisation. The individualistic bias is linked to the concept of universalism where rules and theories are applied universally, to all individuals. Individualism is biased towards wealth creation, sequential time,



consumption and entrepreneurial risk taking. Individualism has an analytical bias towards economics, science, engineering and technology. American corporate culture is highly individualistic and scientific. The USA pioneered piecework paying workers according to the number of pieces produced above a fixed minimum (Hampden-Turner and Trompenaars, 1993). America has more cultural commonality with Britain than with any other European country through history, language, media, etc. Britain, Holland, Sweden and the United States believe in concentrating on the individual self interests to serve their own interests, and the interests of customers and society. The French, Germans, and Japanese consider societal needs first in the belief that they will subsequently be of benefit to all individuals (Hampden-Turner and Trompenaars, 1993).

The Americans prefer push strategies whereas the Japanese prefer pull strategies (Hampden-Turner and Trompenaars, 1993). The pull strategy is characterised by a spirit of partnership to achieve a future goal. The push strategy starts with the present and projects a schedule of sequential stages. The completion of each stage pushes the next stage into motion and if nothing goes wrong the product emerges at the end on schedule. The entire schedule is in jeopardy with the lateness of any one stage, unless time for uncertainties is built into the contract, which is rare in cultures where time is money and competition is harsh. The push strategy is characteristic of the British construction industry culture. The Japanese consider that they see things with both eyes (poly-ocular) with a perception of depth and wholeness, while western culture sees life in a monocular way that isolates and objectifies things (Hampden-Turner and Trompenaars, 1993).

Societal cultural biases influence peoples' attitudes, exposure and responses to risks and accidents. Hampden-Turner and Trompenaars (1993) describe how the Japanese and American directors of a joint Japanese American company acted differently in response to an accident. The American director looked to pin the blame for the accident on an individual. The Japanese manager,

valuing teamwork above retribution, accepted collective responsibility for accidents because everybody makes mistakes and identifying a guilty party might destroy team morale. It is more important to identify the causes of accidents to learn to avoid similar problems in the future, than to apportion blame. In Toyota when a tool bit breaks, workers are asked to consider at least five causative factors. This approach contrasts sharply with the blame approach prevalent in the British construction industry.

The ILO (1985) refer to the blame culture inherent in individualistic US culture, and the characteristics of competition, compliance, structure and adversity, which they contrast with Japanese culture characterised by co-operation, consensus, partnership and social responsibility. A consistent finding in Anglo-American industrial culture is the attitude that safety is an optional extra that costs time and money, as opposed to it being an essential part of any activity. People therefore often consider safety, and safety devices as costly inconveniences that slow down the job (Bird and Loftus 1976; Levine, *et al.* 1976; Andreissen, 1978; HSC, 1993). Speed is of little worth, without control and co-ordination. Control and co-ordination are best achieved amongst co-operating parties. The economic success of Japan and the Pacific rim countries results in part from harmonising competing with co-operating (Hampden-Turner and Trompenaars, 1993).

Positive safety cultures are characterised by employees having a questioning attitude, a rigorous and prudent approach and positive communications (Meshkati, 1995). Communications in organisations are influenced by national culture as well as the organisation's specific culture. Hofstede (1994) and Meshkati (1995) consider that the degree to which employees will have a questioning attitude is greatly influenced by power distance, rule orientation and uncertainty avoidance of the social environment, and the openness of the organisational culture of the plant. Changing from rule-based to knowledge-based functioning, is influenced by the safety culture of the organisation and societal cultural bias (Meshkati, 1995). Emergency actions



may be inhibited due to culture traits, eg, high power distance and rule orientation.

The concept of time as sequential, combined with strong individualism promotes tight time schedules, use of bonus systems and the utility of taking shortcuts. In Caribbean culture time is considered synchronous, the past connects with the present to influence the future, activity is unhurried, people take their time, limited importance is attached to strict punctuality. Life is about enjoyment, people work to live. The collective spirit is demonstrated in the Rastafari concept of I and I is one. Caribbean cultures place high value on expressiveness through conversation, art, music and dance. Nature is respected and considered an essential aspect of existence rather than the European view that it is something to defy, control and exploit (Asante, 1988; Ani, 1994). Clean, sharp lines and divisions characteristic of European culture dissolve into the Afrocentric understanding of the oneness of man and nature (Asante, 1988).

### *11.2.3 Summary*

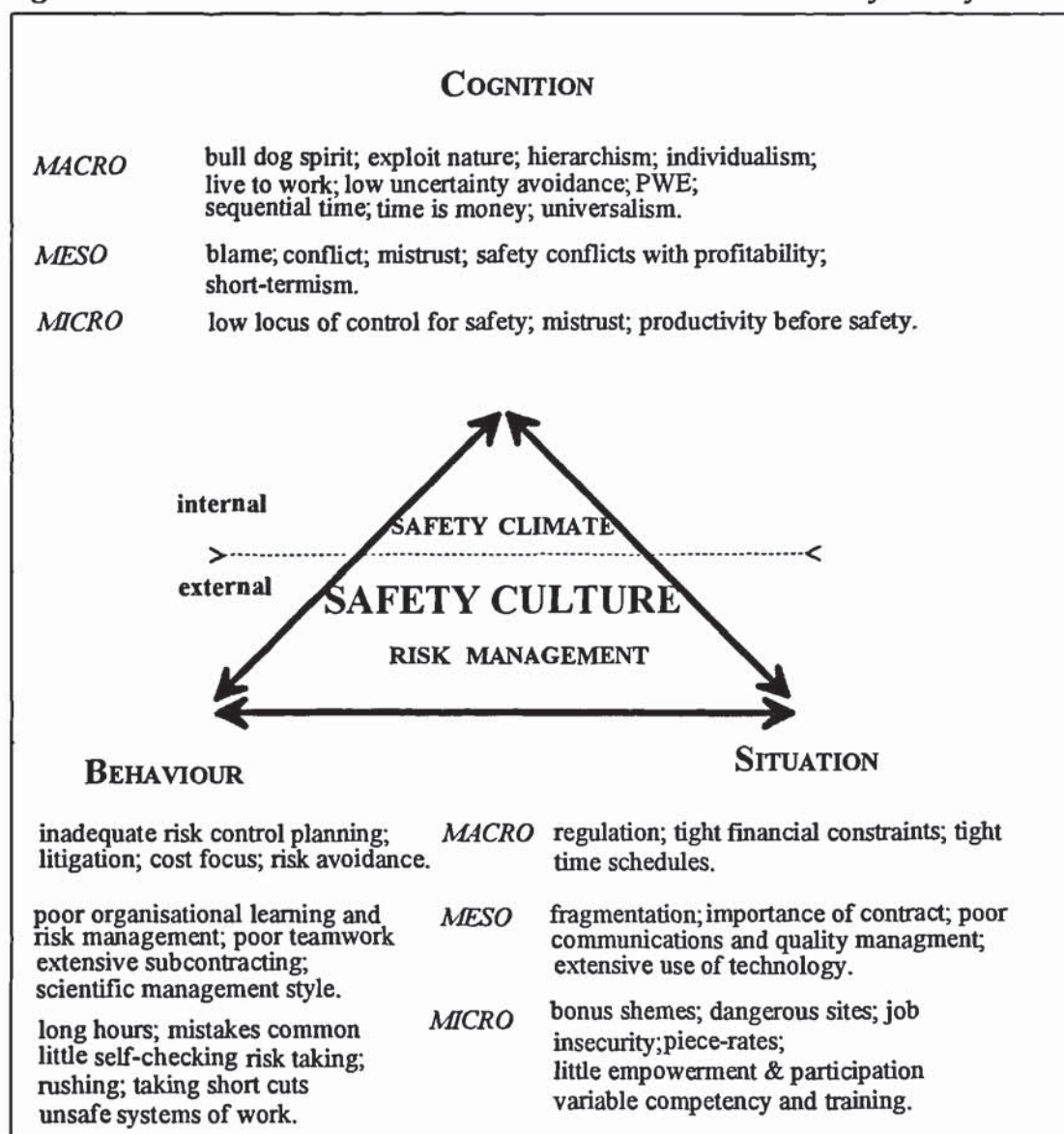
Applying Bandura's reciprocal model of social learning to the characteristics of each safety culture identified in this study, involves identifying the principal behaviours, attitudes and values, and situations which impact on the construction industry. This holistic analysis allows the identification of the key antecedents of safety culture. Three levels of analysis are distinguished, namely the micro (individual), meso (group, organisation) and macro (industry, society) levels.

### *Britain*

Figure 11.3 presents a reciprocal, triadic model of the British construction industry safety culture. At the macro level the nature of the British economy, use of technology, legislation and industrial development impact upon behaviours such as litigation, risk avoidance and transfer, and procurement practices. Societal values such as hierarchism, individualism, time is money,

uncertainty avoidance and universalism influence and are influenced by behaviours and situations. The lack of investment in the construction process promotes risk avoidance, tight time schedules, conflict, mistrust and litigation. Subcontracting and fragmentation increase competition and risk taking, and limits partnering. The attitude that safety conflicts with productivity, low levels of training and contractual pressures are antecedents of poor risk management.

**Figure 11.3 Triadic Model of the British Construction Industry Safety Culture**





The driving force across the industry is schedule, as capital investment cannot be realised until construction is complete. Financing and interest charges spiral with delays ensuring that time is money (Bomel, 2001). Financial pressures result in the need for buildings to be designed and completed in the shortest time possible. The requirement for high speed project completion results in a cost premium and added risk of mistakes occurring. Poorly defined design briefs can lead to mistakes in design that can increase the risk of accidents occurring on site during construction.

Clients often do not spend sufficient time deciding upon their exact requirements, selecting their building team, which includes consultants and the contractor. Contractors complain that clients commonly do not know exactly what they want leading to significant variations from the initial design upon which the work is planned and priced. (Latham, 1994). Clients subsequently argue about the length of time and the costs incurred to implement the new requirements. Competitive tendering limits the amount of influence that builders have on designs, the degree of innovation and investment in new technologies and prevents collaboration between architects, engineers and builders (Atkin, *et al.* 1995). Experience shows that the use of lowest price, fixed bid competitive tendering increases the amount of claims that are likely to be made.

The British construction industry is dominated by nineteenth century attitudes towards labour force issues which pay little regard to the well being of workers (Andrews, 1997). At the micro (site) level individuals in the British construction industry experience situational pressures such as bonus schemes, tight time schedules, poor designs and unsafe working conditions. They have to work long hours, rush work, take short cuts and risks. They often mistrust managers, think they are forced to take risks to get the work done and earn decent money, and find little enjoyment in their work. Risk taking, conflict, restricted participation and team work, and lack of competence are key negative factors in the safety culture of the British construction industry.

Latham (1993) describes the British construction industry as *a mighty machine that requires oil in its engine to drive it (but) has grit instead*. Clients worry that they are being cheated by contractors and will not get the buildings they want. Professional consultants often fear being held responsible by clients for any unseen extra expenditure on contracts. Contractors fear underpayment by clients, overcharging by specialist subcontractors will seek to overcharge them, and being squeezed in the middle between their own original tender price, the rising cost of materials, and inflated demands from specialists. Latham (1993) describes a debilitating culture of conflict:

*... The industry has deeply engraved adversarial attitude. The culture of conflict seems to be embedded, and the tendency towards litigiousness is growing. ... disputes and conflicts have taken their toll on morale and team spirit. Defensive attitudes are common place. A conflict-ridden, adversarial project is unlikely to come out to and time, or to the quality required, and the client will be the loser in the end.* Latham (1993) p10

Popular construction industry definitions reflect the uncertainty and adversity inherent in the British construction industry. The following descriptions were contained in a poster on the wall in the office of a construction manager on a major civil engineering contract:

<i>sub contractor:</i>	a gambler who never gets to shuffle or deal or cut;
<i>tender submission:</i>	a poker game in which the losing hand wins;
<i>tender sum:</i>	a wild guess to 2 decimal points;
<i>successful tenderer:</i>	a contractor who is wondering what he left out;
<i>architects estimate:</i>	the cost of construction in heaven;
<i>management contract:</i>	the technique of loosing your shirt under perfect control;
<i>completion date:</i>	the point at which liquidated damages begin;
<i>liquidated damages:</i>	the penalty for failing to achieve the impossible;
<i>quantity surveyor:</i>	people who go in after the war is lost and bayonet the wounded;
<i>lawyers :</i>	people who go in after the QS and strip the bodies.

The director of a national contracting firm summed up the culture of the British construction industry as a “macho culture that screws the subcontractor” and rewards “crises management” (Latham, 1994). The lack of both trust and money creates an adversarial culture and confrontational environment between clients, designers, contractors and workers. Health and safety matters are considered unimportant in relation to the fight for work completion to tight time schedules and financial survival. The construction industry in the Britain



is contractually one of the most complicated and conflict ridden in the world.

Amec's Chairman and Chief Executive, Sir Alan Cockshaw, stated that:

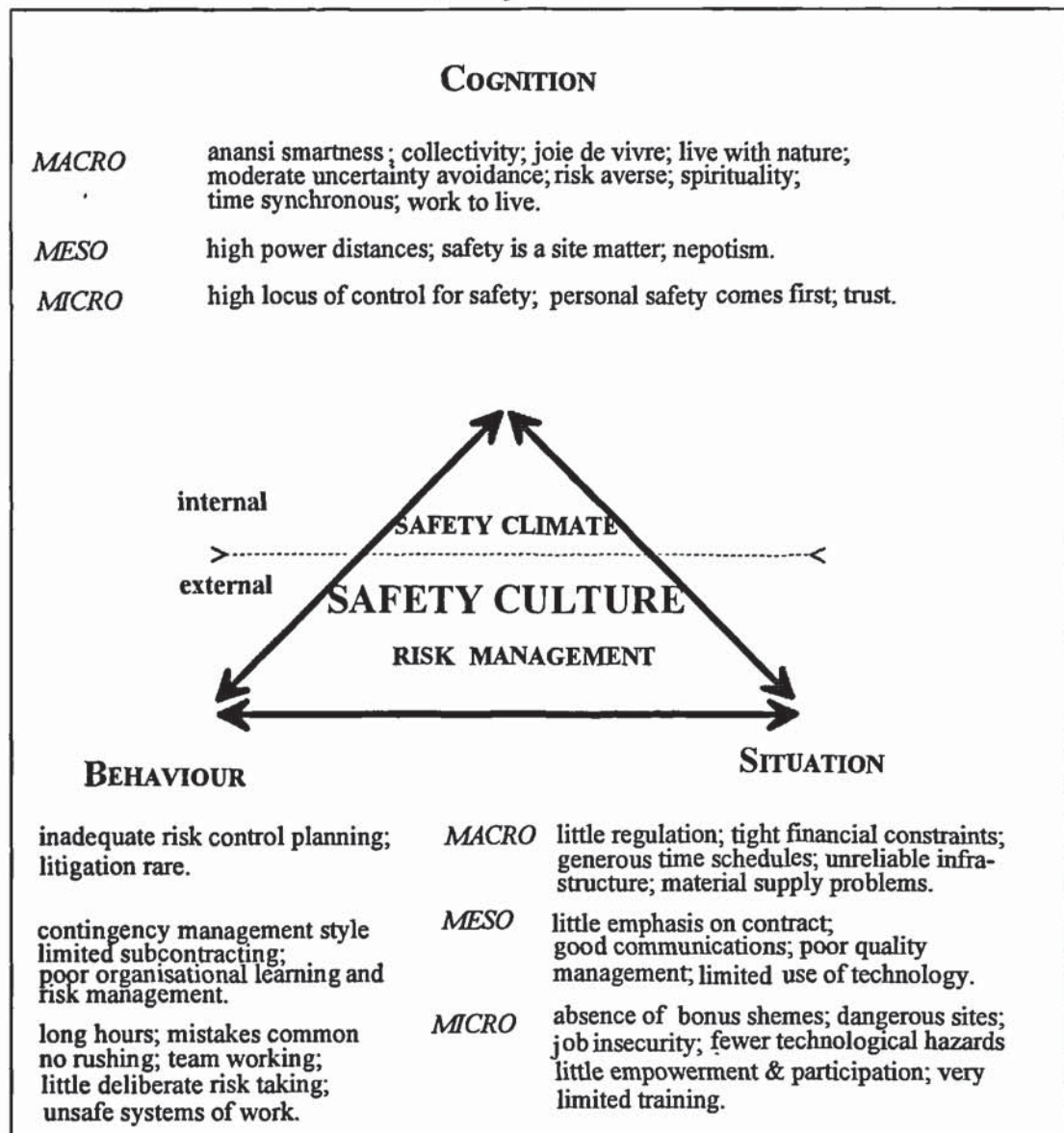
*I have always believed that this is the most adversarial country in the world for the way that contracts are organised. It has to change. The consequence is the clients don't get value. Co-operation within and without the Britain is where a lot of the future lies. Cockshaw (1995) Contract Journal 19 January*

### *The Caribbean*

At the macro level in the Caribbean, the natural environment plays a significant role in shaping safety culture, influencing building designs, construction methods and working patterns. The relative lack of economic development impacts upon the infrastructure, legislature, methods of work and use of technology. Societal values of collectivity, enjoyment of life, spirituality and time is time influence project planning, management styles and working patterns (Figure 11.4). Risk taking is influenced by competency, competition, societal values and the socio-technical work environment. Afrocentric attitudes to work, life and time together with the tropical climate do not promote rushing.

The Caribbean construction industry lacks formal safety management systems and effective health and safety regulation. However, it is characterised by relatively low-technology construction methods, worker enjoyment of work and open communications. Societal values to life, time and work limit the degree of rushing and risk taking in the Caribbean. Bonus schemes are rarely employed and tight time schedules are rarely set. The lack of formal safety management systems at the organisational and national levels within the Caribbean safety culture is countered by positive factors manifest at the site level.

**Figure 11.4 Triadic Model of the Caribbean Construction Industry Safety Culture**



The industrial development of the Caribbean is likely to produce the same problems as it has in Britain and the industrially developed world, both in society and the construction industry. The importation of technological risks without the knowledge or resources to control those risks is a problem the developing world faces. As the use of new construction methods and technology increases in the Caribbean, the use of toxic chemicals and hazardous technological processes produces risks that may not be effectively managed. Training, education and regulation are vital to cope with these risks.



### 11.3 Recommendations for Change to Improve the Safety Culture of the Construction Industry.

To improve the safety record of construction operations around the world, the industry needs to be viewed as one with a poor safety culture and not one which is inherently dangerous (Dester and Blockley, 1995). The projects with the best records are those which are well planned and executed following quality management principles. Improved risk management can be achieved by the adoption of the quality philosophy of continuous improvement and the practices of partnering, bench marking, training and team working (Cooper and Philips, 1995; Lo, 1996; Smallwood, 1996).

Total quality management requires a rigorous examination of working practices, analysis of performance, humanistic management styles, giving feedback and jointly setting targets for improvement. This process does not fit easily with the current practices in much of the construction industry in Britain and the Caribbean. Changes are therefore required in the attitudes, behaviours and situations currently prevalent in the industry, particularly at the source of the funds and work namely the government, commercial clients and major contractors. The myopic emphasis on price during procurement is at the heart of many of the problems in the construction industry. With the exception of the largest organisations, the majority of construction contractors around the world have poorly developed safety management systems. The following section describes the key aspects of effective safety management which, if implemented, would help improve the health and safety performance of British and Caribbean contractors.

#### 11.3.1 *Effective Organisational Safety Management*

Many contractors see little commercial incentive to improve their health and safety management performance because of the likelihood of being visited by an inspector is low, there is little appreciation of the full costs of accidents and it is rarely a requirement of the tendering process (Whittington, *et al.* 1992).

Levitt and Samelson (1987) draw attention to the strange paradox in the

construction industry where a very cost conscious industry often ignores a major area of costs. HSE estimates that the typical cost of material loss and accidents on construction projects in Britain is over eight percent of project value (HSE, 1997). Accident costs are ignored by construction companies due *inter alia* to the longer time frame of accident costs and ill-health in relation to the usual time for completion of projects and the traditional separation of insurance from safety management. Making the full costs of accidents clearly visible on the project balance sheet should motivate management action to improve safety management performance (Laufer, 1987; Levitt and Samelson, 1987; Meijer and Schaefer, 1996).

Senior managers exert an important influence upon an organisation's culture, directing and controlling the way in which it operates, how resources and rewards are allocated and systems are implemented. Their attitudes and values pervade the culture of the organisation because of their hegemonic position. The primary responsibility for safety within an organisation rests with those who direct the company's operations. Leaders committed to safety management hold all managers accountable for the safety of their subordinates, allocate substantial organisational resources to training, and monitor safety performance. Organisations where the Chief Executive shows a strong concern for safety and communicates this by word and deed, have better than average safety records (Levitt and Samelson, 1987).

Directors need to ensure that they give managers clear responsibilities, provide adequate resources for safety management, only appoint competent subcontractors and promote a spirit of co-operation and partnership. Company executives need training in safety management, its links with quality management and creating a positive safety culture. Building a strong safety culture takes effort on the part of the chief executive and senior management. They need to communicate the message that safety is of critical importance to the company in direct contacts with employees at all levels, ie, management by walking around as advocated by Peters and Waterman (1982). Reducing



employee turnover and increasing contact between the chief executive and other employees facilitates the development of a positive safety culture.

Managers need to encourage the development of motivated teams of operatives because they are actually closest to the product and also therefore to the customer. In the Britain labour costs typically represent 50 to 65% of construction activities compared with the typical figure of 25% in manufacturing, yet manufacturing devotes far more effort to team building (Chambers, 1997). Team building represents an attempt to return to trust as a basis of employment. Communication skills are essential for effective team performances and require a supportive humanistic environment. Studies of work and motivation on large industrial construction projects in the USA have found that productivity is highest when workers are made to feel that they are involved in decision making, and feel a valued part of an organisation (Borcherding, *et al.* 1980).

Construction managers tend to hire and fire to solve their site labour problems. Firing workers is avoided among the managers with the best safety records. Construction managers are often referred to as *fire fighters* who react to events rather than plan to avoid them (Levitt and Samelson, 1987; Marsh, 1995). Managers' actions are often limited by the conditions of contract (including time, risk, and money), the quality of the design and planning of the project, the labour on site, their own abilities, and the demands and expectations of more senior managers. If the antecedents of *fire fighting* are removed by adopting quality management philosophy, management behaviours will change.

Front line supervisors form the link between the management team and the workforce, and are therefore important to construction safety and productivity. They need to be trained to give constant feedback on safety performance, praise good safe work, stop dangerous situations and behaviours, treat workers with respect and ensure that material handling and housekeeping is

maintained at a high standard (Levitt and Samelson, 1987). The lack of competent front line supervisors in construction is a serious issue. US construction supervisors who paid extra attention to new workers had fewer than half as many accidents as the supervisors who did not (Hinze, 1976).

Front line supervisors need to orientate new workers by describing the site and the safety rules, and by giving people a test of their ability to operate equipment or the process for which they are employed.

The construction industry is characterised by high labour turnover, job insecurity and poor personnel management. Little proactive effort is put into formal recruitment practices, training and creating good working relations with site labour. Induction training for new workers is important in all industries and particularly in the construction industry. New workers should be introduced to the local management and workforce and watch safe work practices before becoming involved in them.

The adoption of TQM and loss control philosophies promote the growth of positive safety culture. Systems and procedures should be formulated by empowered multidisciplinary safety management teams. The philosophy of the organisation and the responsibilities of shareholders, directors, managers, supervisors and manual workers need to be clear. Safety goals should be set, risks assessed, training given and safe systems of work formulated and implemented with regular monitoring, feedback, and rewards given for good performance.

Improvement in the safety culture of the construction industry is dependent on changes in the construction process itself. This requires changes in the physical, social and economic characteristics of the industry, rather than solely upon discreet changes of site worker attitudes and behaviours and the immediate physical environment. Those who hold financial and bureaucratic power in the construction industry are extremely important (Dawson, *et al.* 1985; Leather, 1987; Ball, 1988; Latham, 1994). Governments as well as other



clients and design professionals play a major role in determining the wider culture of the construction industry. Quality issues such as competence requirements, partnering, risk management arrangements, contractor selection criteria and dispute adjudication procedures should all be important parts of the evaluation process. Many of the core decisions are in the hands of government, eg, investment, regulation, and taxation. The level of domestic construction workload is ultimately determined by government economic policy which should take into account the need to maintain an even flow of work to the construction industry (Latham, 1994).

### *11.3.2 Changes Specific to the British Construction Industry*

Leading figures within the British construction industry, including safety managers, trade unionists and company directors, identify time and training as the two most important areas to address to improve construction site safety (Construction News, 1997). Time pressures and inadequate information result in the prioritisation of schedule, cost and quality, and the neglect of health and safety (Smallwood, 1996). Time and cost schedules should be devised in consultation with all the relevant service providers, with adequate slack allowed for contingencies. Many site workers, supervisors and the directors of small companies whose number dominate the Britain construction industry, have little or no formal safety management knowledge and place little emphasis on safety (Dawson, *et al*, 1985). Many building designs have inherent hazards which are not identified and removed or controlled by designers, due to their ignorance of site safety issues. Improving competency and decreasing time pressures are key issues to address if the safety performance is to improve.

#### *Procurement*

Each stage of a construction project should be seen as a partnership between all service providers in which the client should have some involvement. Effective competence assessment will allow parties to enter into the procurement process with confidence that all parties will be able to deliver quality services. The common use of a construction management style procurement route would

give clients direct contractual relations with all service providers offering the opportunity for closer working arrangements. Whatever the procurement route, the principal contractors should be allowed to input their expertise into the design process to improve buildability.

Experience proves that there must be some degree of flexibility upon contractual liabilities due to the uncertainties inherent in the construction process over the lifetime of a project. Variations can originate from the employer, consultant or contractor and have financial and legal repercussions. The building team must be prepared for change and know how to manage it to minimise its impact. Improved procurement practices will reduce risk spreading and poor management practices, which often lead to tortuous contractual liabilities, excessive claims and too many parties being involved.

#### *Partnering*

The construction industry should learn from the examples of other industries and change its adversarial culture (CIRIA, 1997). Good open communications are promoted when the focus of the client is on quality rather than cost. A close relationship between client and service provider is unusual in construction, but helps minimise the tendency to concentrate primarily on price, rather than on quality and value for money. Partnering, based on the concept of team work for mutual benefit, requires respect, trust, an understanding of each partner's needs and the proactive management of risk. Team building is about people, trust and commitment. Each team member needs to understand and respect the risks that others are taking and to support them when necessary, rather than seek one-sided advantage from the situation. Team leadership is critical for creating the right atmosphere, harnessing the full potential of team members, and encouraging active co-operation.

*Team building can make a substantial contribution to overcoming construction's traditional failings of mistrust, lack of empathy, poor communications and unaligned goals. CIRIA (1997) p1*

Up to 80% of British TQM initiatives fail due to a lack of senior managers commitment, lack of a long-term humanistic perspective, uncertainty on how



to introduce quality techniques and resistance to change (Atkinson (1990) quoted in Cooper and Phillips, 1995). Even the most proactive British companies on safety management score poorly on the systematic and humanistic aspects of safety management, including the role of senior management on the ISRS audit (Stanton and Baber, 1991). The lowest scoring categories of the audits of JLEP contractors were for monitoring and reviewing and competency and training. The process of the critical planning, monitoring and review of safety performance appears to be a cultural failing in Britain.

The construction industry tends not to represent the diversity of the society it serves. African-Caribbeans are underrepresented in the professions and at senior management level. Females are underrepresented in construction and tend to be restricted to employment in secretarial and clerical work both in the Britain and Caribbean. However, female trades workers were more commonly encountered in the Caribbean. Women account for 43% employment in the Britain, but less than 10% of employment in the construction industry. The British construction industry needs managers who are less prone to taking risks and can empathise with workers. This combination of qualities are more highly developed in women, just as risk-taking and assertive behaviour are usually more highly developed in men (Langford, *et al.* 1995). The industry needs to change to be more representative of the diversity of society to encourage new attitudes and behaviours to improve performance.

#### *The government*

The government is currently facilitating cultural change in the British construction industry by implementing legislation, setting targets for risk management performance and providing expert advice on best practice. Following the publication of the Latham Report (1994), the government produced a bill to promote harmony by removing adversarial practices. The government also changed procurement practices in the spirit of Latham, by placing new emphasis on partnering and team work, instead of price as the basis of competitive tendering. The *Working Well Together Campaign* brings

together the various players in the industry and promotes the setting of health and safety improvement action plans. The government is trying to reduce the prevalence of boom, bust economic cycles which limit the development of the industry and result in a focus on the short term.

To further improve the safety culture the government could introduce economic incentives for effective safety management, mandatory auditing of health and safety management systems, health and safety as a mandatory item in companies annual reports and integrate health and safety management advice into a range of business development processes (RoSPA, 1996). Other measures which the government could implement include regulating the flow of construction work as in Sweden and Singapore. New approaches need to be developed to promote health and safety in small firms who often have limited knowledge of health and safety legislation and few resources to devote to improving health and safety standards. Greater emphasis is needed on consultation, experimentation and joint working.

In Britain the CDM 1994, MHSW 1992 and CHSW 1996 regulations, government sponsored reports by Latham (1994) and Egan (1998), and new forms of contract direct the construction industry to change and improve the safety culture of the industry, but change in the industry is slow and limited in extent. Birchalls and Finlayson (1996) found that knowledge, awareness and compliance with the MHSW regulations was related to the size of the firm. Large firms generally have the resources for, and identify the benefits to be gained from, safety management; more so than small firms. Characteristics of positive quality management cultures, include high levels of trust and respect for individuals, a shared sense of membership of the organisation, and commitment to continuous improvement (Cooper and Phillips, 1995). The scientific management styles prevalent in the British construction industry are not quality orientated. Societal bias towards the economic imperative of time, individualism, low uncertainty avoidance and masculinity promote aggression, ignoring legal duties, litigation, risk taking, rushing and taking short cuts.



These negative factors that impact upon safety culture have been identified, the challenge now is to implement effective measures at every level of safety culture to effect positive change.

The government held a Construction Summit involving the industry's leading stakeholders in February 2001 to try and kick-start the improvement process following the Egan Report (1998) due to worsening fatal accident figures for the industry. Clients recognised the need to introduce a culture of continuous improvement, designers recognised that they needed to improve their knowledge of risk and control measures, and contractors identified competence, co-operation and fragmentation as key areas for improvement (Bomel, 2001). Trade unionists highlighted concerns over competence, employment status and the need for greater regulation. While all these issues are valid areas to target improvement, they may well have little success because they address the symptoms rather than the root causes of the industry's poor performance. Wider efforts are needed to address the macho values which see time as money and adversity as normal due to the cultural bias towards individualism, masculinity and hierarchy.

### *11.3.3 Changes Specific to the Caribbean Construction Industry*

Caribbean construction organisations lack of formal quality or safety management systems. Obstacles to the successful implementation of TQM in the Caribbean, include colonial management styles, confrontational labour relations and poor political leadership (Charles, 1994). Improved worker education, the use of joint problem solving teams, and upgrading the quality of management to improve their management style, represent the kinds of approaches that are necessary to improve the work culture in the Caribbean (Stone, 1982). Punnett (1986) confirms the utility of participatory goal-setting techniques in the Caribbean. When motivated, Caribbean workers are an asset to TQM because they take pride in their work and enjoy participation (Charles, *ibid*). Boxill (1993) infers that any organisation that manages to harness the Caribbean creative energy and enthusiasm, is certain of success.

The regulation of occupational health and safety law in the anglophone Caribbean is minimal due to the over-stretched state of the legal apparatus, the lack of inspector powers, no history of enforcement action, and the lack of major catastrophes to stimulate governments to change current systems. There has been a failure to delegate powers of prohibition and prosecution to inspectors, who currently have had little chance to affect change in industry without recourse to higher authorities who lack professional safety training and expertise. The relatively small population sizes of individual Caribbean countries means close ties exist between politicians, the judiciary, top civil servants, and industrialists, through family, community, school or through work ties, which tends to reduce the effectiveness of the formal legal process.

Low pay and morale, staff shortages and limited legal powers reduce the effectiveness of the system of regulation of occupational health and safety in the Caribbean. There is no easy mechanism for changing legal standards or for setting technical standards in relation to changing work environments and technologies, and therefore for reducing the risks faced by employees and members of the public, eg, biological hazards. There is no protection for non-employees who may be affected by an employer's operations, eg, formulation of emergency response measures for hazardous installations. There is no general power of immediate prohibition for inspectors. Few industrial diseases have been prescribed, there is therefore no real occupational health concern, as little information is available. Occupational health and safety law is not enforced, while the stated level of fines are out of date. There is little co-ordination between the various government agencies who deal with the different aspects of health and safety.

A fundamental change in the attitudes towards health and safety of both governments and employers is needed in the Region. Despite pressing matters, such as structural adjustment, attracting foreign investment and tackling rising crime rates, Governments in the Caribbean need to stimulate the development of a positive safety culture in their societies to reduce the current



and potential loss both in terms of human and material resources. Caribbean governments, possibly through CARICOM-wide initiatives, could take the following measures to encourage the development of positive safety cultures:

- ♦ extend and update health and safety laws to include all employers, employees, and those effected by work activities. The application of general health and safety laws should be widened to cover all workplaces including hotels, offices and places of entertainment, which are particularly important industries where tourism and banking dominate economies, and increase the level of punishment for offences;
- ♦ institute construction specific legislation which covers the procurement, design, construction, maintenance and demolition phases and occupational health issues;
- ♦ appoint specialist construction inspectors, promote inspectors as state provided advisers to help organisations prevent loss and provide them with adequate resources, training and powers (eg, prohibition and improvement notices);
- ♦ develop regional and national policies on effective health and safety management as required by ILO convention no 155;
- ♦ actively seek to collect and disseminate occupational health and safety relevant guidance from other countries;
- ♦ make directors of companies personally responsible for their undertaking's safety performance and culpable for specific breaches of the law. Also require them, in conjunction with their insurers, to submit annual health and safety reports to the inspectorate.
- ♦ direct insurance companies to play a more active role in safety by providing safety audits, varying premiums according to safety performance, and reporting incidents.
- ♦ encourage trade associations and trade unions local councils to play an active role in safety by providing safety audits, training and advice.

- ♦ increase the availability of health and safety training, including the involvement of schools.

### *Summary*

This section makes recommendations for positive changes in the safety culture of the construction industry. For Britain the recommendations made aim at removing adversarial aspects of the construction industry culture and developing effective management systems. The recommendations made aim to create more collective bias to counter the individualistic bias within the British culture that is particularly apparent in the construction industry. In the Caribbean improved safety training and safety management at the organisation and national levels and a major overhaul of the regulatory framework would assist in improving the safety culture of the construction industry and the region. The quality management philosophy provides a common framework for improvement.

The Caribbean region is characterised by a relative lack of regulation, informal management systems with colonial management styles and slow pace of life and work. Time pressures, distrust, adversity and the lack of involvement of construction workers in the management of safety are negative characteristics of the British construction industry safety culture which are at the heart of the industry's problems. Common British construction worker attitudes include the need for risk taking, time pressure on work completion, and a lack of confidence in management's actions regarding safety. This attitude persists due to the continued presence of negative safety factors such as production bonuses, danger money, tight schedules, adversarial attitudes, low capital, etc. The British construction industry, true to its cultural biases, is strong on legislation and inspection, but weak on integrating health and safety matters across society and implementing quality management techniques.

In Britain there is a need to reduce the pressures placed on site operations while in the Caribbean there is a need to increase the availability of health and



safety information and training, improve safety management techniques of contractors and impact of government regulation. The cyclical nature of the economic market in which the construction industry operates, tends to limit organisational memory, increases the complexities of contractual relationships and responsibilities, and encourages short-termism, resulting in a lack of investment in safety management and training (Whittington, *et al.* 1992). Government and industry action to try and reduce the negative impact of economic cycles and improve the regulation of the industry should result in improvements in the industry's health and safety performance. In Britain there is a clear need to replace adversity by encouraging trust through partnering, greater involvement of contractors in design, promotion of best practice and setting performance targets. In the Caribbean this approach needs to be supplemented with improvements to the regulatory system to spur improvements in health and safety management by contractors in the industry.

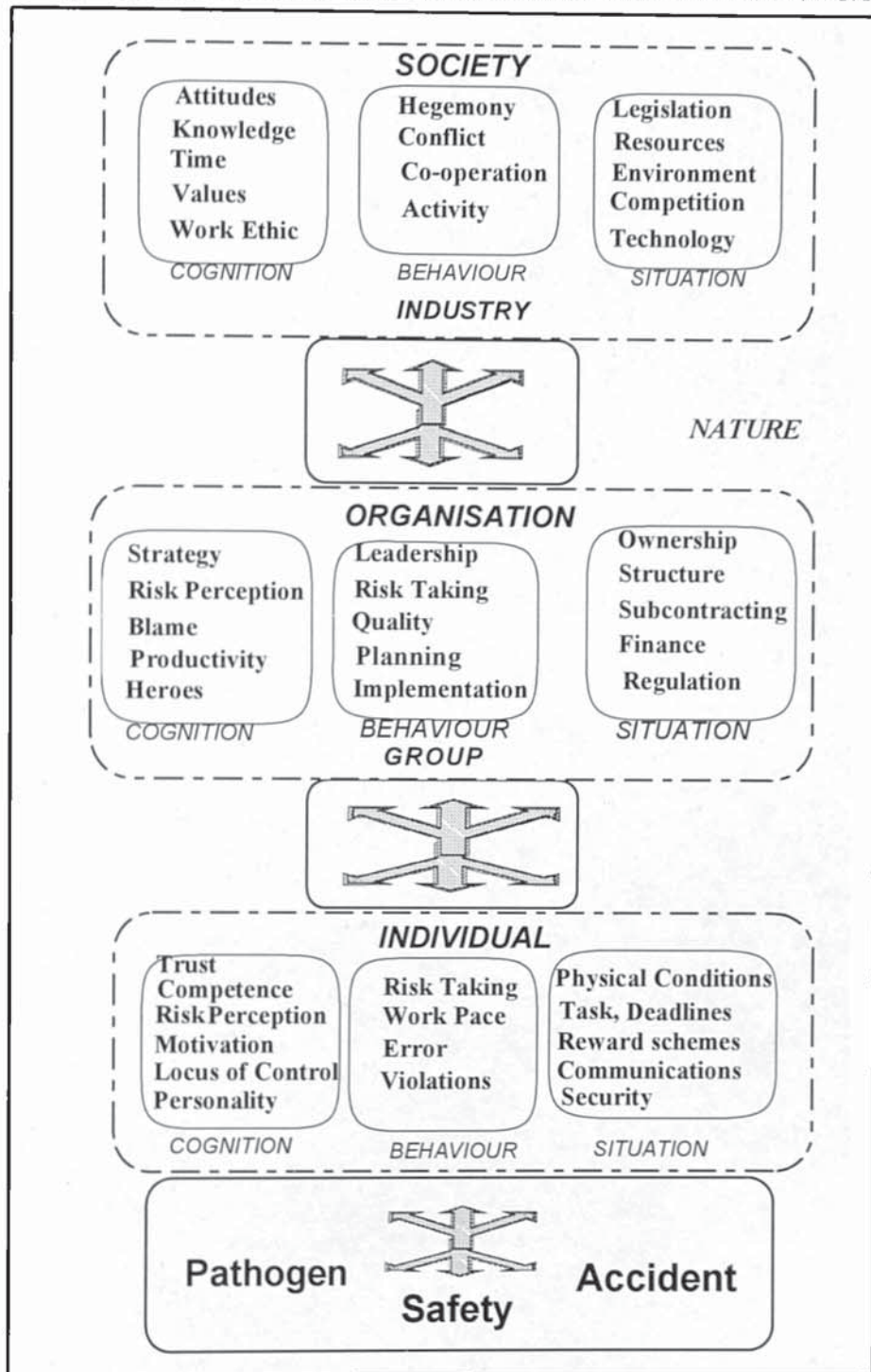
#### **11.4 Models Derived from this Analysis**

This section proposes new models of safety culture and accident causation theories based on this research. A holistic model of safety culture maps out the key influences upon safety culture. The linear domino models of accident causation are rejected in favour of a multi-layered interactive model.

##### **11.4.1 Accident Causation Model**

From this work an interactive model of accident causation is proposed based on the safety culture paradigm. Following Bandura (1977, 1986) the key behavioural, cognitive and environmental influences on safety culture are identified by this study at the individual, organisational and societal level. The model (Figure 11.5) describes the accident causation process as a complex system where individual factors, interact with group, organisation, industry and societal factors to produce accidents. In turn, accidents influence, individuals, groups, organisations and societies. The complexity of the causal relationships in accident generation prevents many from acknowledging their own culpability (Smith, 1998).

**Figure 11.5 Socio-technical Model of the Accident Causation**



This multi-layered model includes the impact of nature upon the human system which are absent in most models of accident causation. High winds cause many unsecured scaffolds to collapse every year in Britain resulting in human and financial loss. The lack of effective ties can result from a worker or manager taking a short cut, making an error or being incompetent, a designer



specifying the incorrect method, a client selecting an incompetent contractor or refusing to allow drilled fixings to their structures. At the societal level factors which impact on this situation, include the extent of health and safety training, health and safety law and its enforcement, and the values of the society to work, people, time, etc. Even if the true costs of accidents are recognised, and managers accept their role in causality, they may still trade long-term improvements for short-term financial gain in the hope that it won't happen, because of a bias towards short-termism and focus on financial imperatives (Smith, 1998).

The interactive nature of the model is important. Traditional domino models of accident causation focus on organisational and individual factors, depicting a progressive, unidirectional, linear sequences resulting in an accident. This multi-layered, interactive model includes societal factors, in addition to organisational and individual factors. Each factor identified can interact with factors at the same and different levels within the system leading to accidents. Following Rasmussen (1997) this system-orientated model is based on functional abstraction rather than structural decomposition. It is a cross-disciplinary model which includes influences at all levels of the socio-technical system which facilitates the production of *AcciMaps* of the contributory factors involved in industrial accident causation. For example, the degree of technological development and deployment within a society will influence the types of hazards faced by a society, the way in which it is regulated, members perception of risk, organisations' strategies and methods of production, working conditions, work pace and the chances of an employee having an accident.

Whittington, *et al.* (1992) in one of the most comprehensive studies of human factors in the British construction industry produced an accident causation ration of 2:1:1 between site management, headquarters and individual causative factors. They highlight the impact of organisational factors on the way in which construction projects are organised and managed, but did not

quantify the contribution of designer, client and societal factors. The European study of construction accidents, which supported the Mobile Work Site Directive, traced construction accident causes back to individual, site and design factors. The study found that 36% of fatalities were caused by inadequate design, 27% were caused by poor planning and organisation, while 37% were caused by failings in work execution (Commission of European Communities, 1993). It found that over 60% of construction fatalities could be attributed to design and management decisions made before the work began. In many cases, these decisions reflected poor project design, inappropriate materials or machinery, ineffective organisation of the work or inadequate co-ordination between the different parties involved.

In the construction industry the focus of the client on cost rather than quality leads to adversarial attitudes, risk transfer, fragmentation of the construction process, poor risk management and litigation. Uncertainty relating to the amount of construction work generated within the economy at any one time, forces contractors to limit the resources put into process management and encourages subcontracting. Because of competitive tendering, contractors put in low bids for work resulting in the lack of resources to devote to training, planning and safety management, and adversarial attitudes and litigation. The financial and time pressures put upon the construction process encourage risk taking and a fast work pace which promote errors and accidents on site.

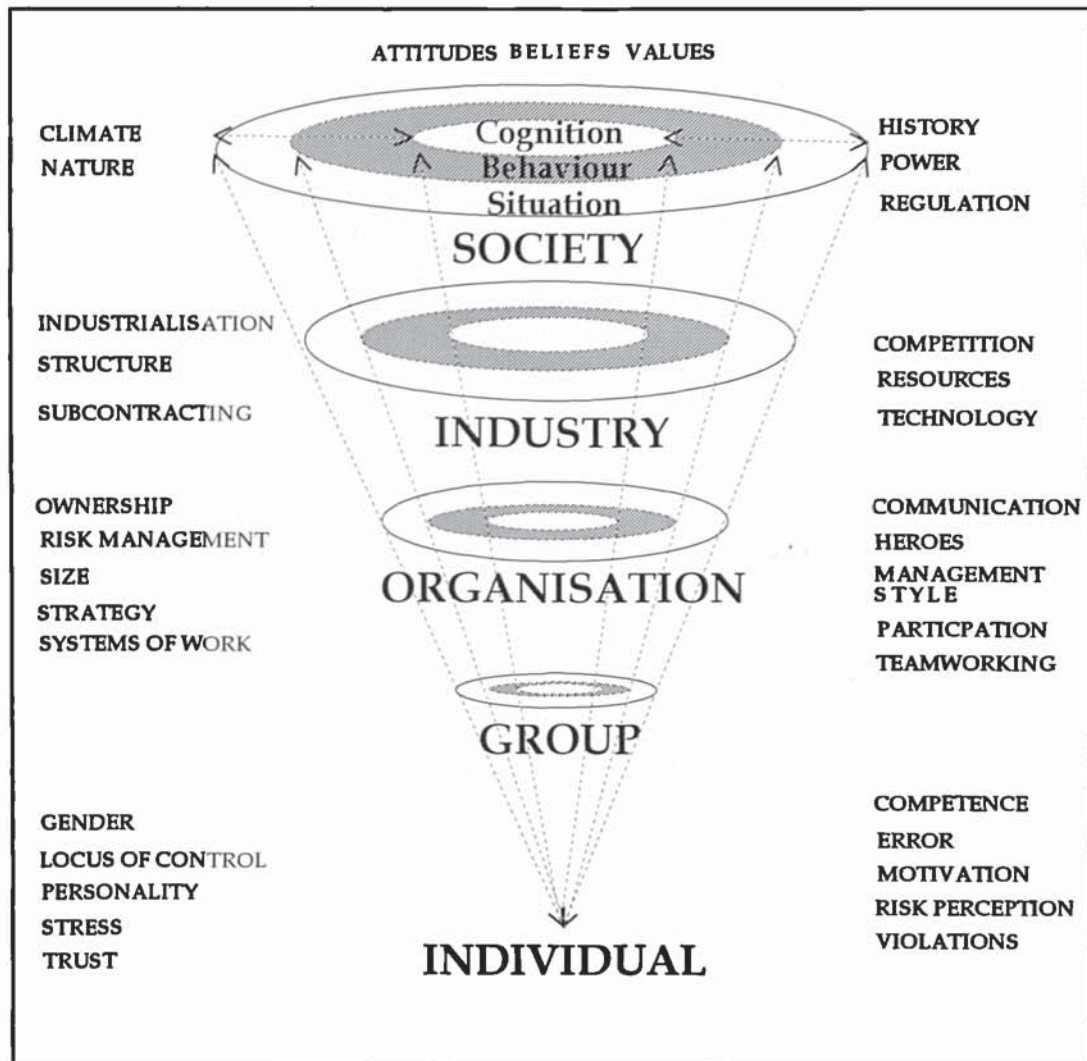
#### *11.4.2 Vortex Model of Safety Culture*

This study utilises Bandura's theory of social action to examine the safety cultures of the construction industry in Britain and the Caribbean. A conceptual model of safety culture emerges which combines cognitive, behavioural and situational factors in a multi-layered and interactive vortex (Figure 11.5). In this vortex model of safety culture key influencing factors are identified at the individual, group, organisation, industry and society levels. These factors interact and influence each other both vertically and horizontally within the vortex producing unique safety cultures. Within each organisational



safety culture and subculture, the combination and interaction of factors will be different. Factors that are key at the organisational level within the vortex may well have antecedents in different parts of the vortex. The model should be used as a conceptual map and tool for identifying the complex relationships within safety cultures.

Figure 11.6 Vortex Model of Safety Culture



The validity of this model can be demonstrated by examples derived from this study. The British system of occupational health and safety regulation has a significant impact upon the construction industry, perhaps most recently demonstrated on construction sites with the introduction of new techniques of fall protection including double guard rails on scaffolds, the use of netting and the CDM regulations. These requirements, which have now become

established site practices, came about through changes to the construction regulations prompted by an EU directives. Despite the success of the HSE in changing specific construction industry practices, the adversarial, competitive, fragmented and litigious nature of the industry ensures that health and safety duties and risks are frequently avoided, ignored or transferred resulting in site accidents. In addition, the HSE has had little impact on the small contractors who dominate the industry and who have little knowledge of the legal standards and little interest in compliance. Construction works are frequently poorly planned and executed, rushed and hazardous.

Systems of health and safety law and enforcement in the anglophone Caribbean were established under British colonial rule, and include the creation of labour inspectorates. However, occupational health and safety law has only rarely been updated and labour departments are frequently under funded and relatively neglected due to more pressing societal matters. The lack of resources and legal muscle restricts the influence of labour inspectorates. Construction companies do not actively seek to comply with legal standards and health and safety issues are seen as a site matter. The risks associated with local practices, such as the use of timber scaffolding without edge protection, are mitigated by individual behaviour on site.

Despite significant regulatory and site management efforts to provide fall protection, falls account for half of all British construction fatalities. In the Caribbean edge protection is commonly lacking, fall arrest equipment is rare and working platforms are not fully boarded. The absence of edge protection is balanced, to a considerable degree, by the behaviours of Caribbean workers who avoid rushing and are aware of hazards they face. In the Caribbean the relatively slow pace of work, high level of worker agility and sense of locus of control over safety are cultural factors that help to explain the relative lack of falling accidents compared with Britain. Despite the common occurrence of unprotected drops, the absence of formal safety management systems and minimal impact of health and safety inspectors, mediating cultural factors



reduce the potential for falls, corresponding with Hinze's (1996) *Distractions Theory* and Leather's (1987) *PAS Model*.

In the Caribbean the tropical climate affects the designs of structures, choice of materials, perceptions of time, work pace and work patterns. Time does not equate with money and people are prepared to take their time to do things. African-Caribbean culture places emphasis on collectivity, spirituality and *joie de vivre*. Both Caribbean and European construction professionals working in the Caribbean stated: *people live to work in the Britain, while in the Caribbean they work to live*. It is postulated that the values of enjoyment of life, risk aversity and resistance to rushing influence individual behaviour in the face of danger on construction sites. The cultural biases identified in the safety culture correspond with societal biases. (hierarchical bias in Britain and egalitarian bias in the Caribbean) following Thompson, Ellis and Wildavsky (1990).

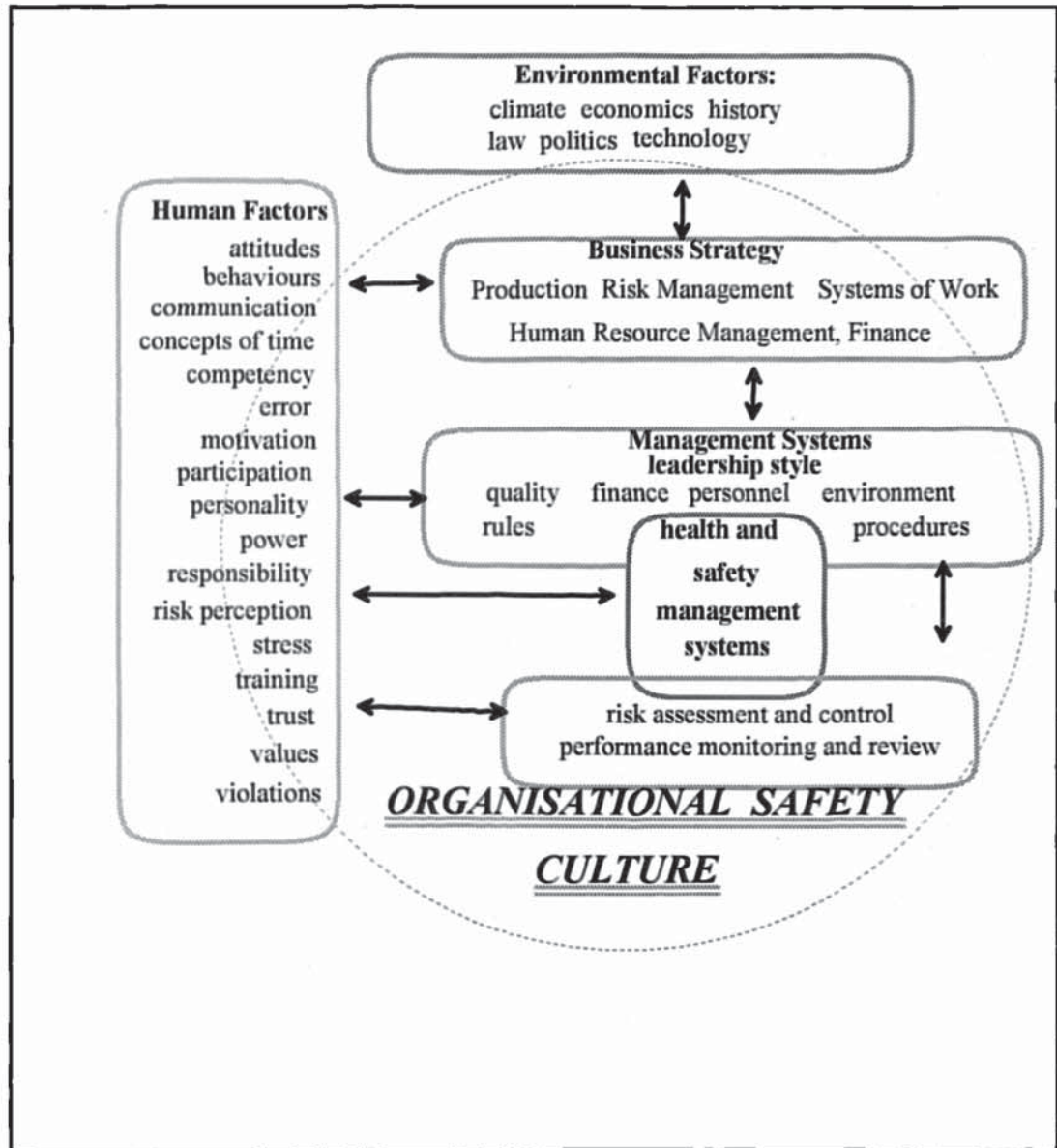
#### ***11.4.3 Holistic Model of Organisational Safety Culture***

The model depicted in Figure 11.6 represents a conceptual map of organisational safety culture. This holistic socio-technical model expands the safety culture paradigm to include factors outside of the organisational setting. Societal factors and individual factors interact within the organisational context to create the prevailing safety culture. Boundaries within this model are irregular and ill-defined reflecting the complex and chaotic nature of socio-technical systems.

Safety culture is the emergent product of human activity and is influenced by the interaction of factors such as cognition, power, industrial development, organisational behaviour and personality. This interactive holistic model of safety culture is conceptual, rather than deterministic. It provides a structured map which allows the consideration of key determinants of risk management culture. Regardless of whether the analysis is conducted at the level of the group, organisation, industry, or society, the model provides a guide to the range of key factors which interact and determine safety culture. The model

highlights important areas to consider when examining each key factor. Boundaries between factors within the model are deliberately left ill-defined to indicate the variable and irregular nature of this chaotic system.

Figure 11.7 Holistic Model of Organisational Safety Culture





## 11.5 Critical Review of Methodology

This research used a variety of methods to collect, analyse and triangulate data relevant to the study of safety culture in the construction industry. Evidence from auditing, observation, interviews, literature reviews and questionnaires is used to evaluate the safety culture of the construction industry in the Caribbean and the Britain. Questionnaires and audits were tailored for each region to ensure the accuracy and relevance of the data collected. Responses to questions were recorded in note form or on questionnaire score sheets. Tape recording was not a practical option due to the noise on construction sites and its potential to raise interviewee suspicion restricting the openness of responses. The findings derived from the data collected during the fieldwork stages of this study are compared to the findings of previous research on safety culture and the construction industry. The combination of information provides a comprehensive data set to produce a meaningful profile of the safety culture of the industry in the two regions.

The techniques used in this study present a number of methodological challenges. Responses provided to the questionnaires cannot be validated, auditing cannot be precisely replicated and both cultures are constantly changing. This research is difficult to replicate because the work represents a snapshot in time of the two cultures under study. However, the principal differences between the two cultures remain as we enter the new millennium. The models developed by this work and the use of cultural theory need to be tested to prove their utility for the analysis of safety culture.

The use of attitude scales raises a number of methodological issues including the validity of the question sets. Phillips *et al* (1993) define nine categories of items on the UMIST measure of safety climate. There does, however, appear to be some confusion over what is being measured. The first category entitled *Management Attitudes Towards Safety* includes items relating to workers' perceptions of management behaviours rather than management's attitudes, eg, items relating to management coming down hard on safety or putting

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hazards under control, spending money and adopting new ideas for improving safety and trying to reduce risk levels, relate more to behaviours than attitudes. The category would be better titled *Worker attitudes to safety management*.

Phillips *et al* (1993) maintained that the distinction between management attitudes and behaviour could not be supported by their findings. The same results emerged from this study. This suggests that either the questions are inappropriate and/or the difference is arbitrary as one cannot occur in isolation from the other. There is a lack of clarity in item statements which often include both a management attitude and behaviour, (eg, items 15 - management care and reduce risk and 16 - management knowledgeable and act). Further work on safety climate need to address the issue of question rephrasing to ensure clarity of the point of issue.

#### *Risk Perception*

The issue of risk perception is problematic. People often underestimate the likelihood and severity of those risks which they perceive they have control over, produce high rewards and which they encounter voluntarily (HSC, 1993). Workers tend to underestimate the risks that they commonly face in their work. Zimmolong (1979) found that painters and scaffolders underestimate the risk of falling in their work. British Rail workers were found to be very conscious of high consequence risks, but considered low consequence, high frequency minor accidents were perceived to be the result of careless behaviour (Guest, *et al.* 1994). Individuals' perception of risk will depend to a large degree on their attitudes which are greatly influenced by their experiences. Risk perception involves judging the likely severity and frequency of an event, based on heuristics that are prone to bias. Rundmo (1999) suggests that emotions and rule breaking are the most important indicators of risk taking behaviour.

Despite what at first glance, appears to be an appealing link between people's perception of risk and accident experience, there is no clear cut relationship. Leather and Butler (1983) found that those construction workers who



experienced accidents at work perceived the risks to be greater than did those colleagues who had not experienced an accident. Brown and Holmes (1986), in a study in the US construction industry, found that accident victims had lower perceptions of risk and management concern for safety, than did those workers who had not experienced an accident. No differences were found between poor and good safety performance sections in their perception of risk at British Rail (Guest, *et al.* 1994). It is a point of debate as to whether to score perception of danger as a positive or negative aspect of safety climate. Phillips and Cooper (1995) consider that it is a negative aspect reflecting a lack of management concern. General awareness of danger can also be considered positive, whilst personally feeling at risk of having accident is negative. Therefore items 5, 18, 25 on the UMIST safety climate scale can be interpreted as positive aspects of safety climate and therefore should not be reversed scored, while items 10, 17 and 22 are negative factors of safety climate.

The use of safety climate measures tends to fall into two camps, those set on identifying the key determinative factors of safety climate (Zohar, 1980; Brown and Holmes, 1986; Dedobbeleer and Beland, 1991), and those which seek to provide a comparative measure of safety related attitudes (Phillips and Cooper, 1995; HSE, 1997). This study uses them in both ways to provide a triangulated and holistic examination of safety culture. Safety climate scales are an important method for exploring cognitive aspects of safety culture which can be tailored to different cultural context both within and between groups, organisations and societies. However, they are limited to providing only a snap shot and partial insight into the complex nature of the social cognitive aspects of safety culture. Only limited success has been found linking safety climate results with audited safety behaviours (Litherland, 1997).

At the societal level issues of comparability of samples extend to social economic status. The samples used in the work of Hofstede and Trompenaars and Hampden-Turner are both biased towards middle class workers in international organisations, in contrast to the manual construction workers

who make up the sample examined in this study. The impact of differences in economic class on values within societies needs to be assessed. This work did not formally assess societal values by sampling or survey, but obtained evidence by adopting ethnographic approaches and reviewing Caribbean and Afrocentric philosophy. Detailed confirmatory research of societal cultural bias in Britain and the Caribbean would shed light on their nature and their influence upon safety culture.

### 11.6 Future Safety Culture Research

This study widens this analysis to consider the impact of societal cultural influences, but does not provide the means for quantifying the relative influence of each factor. Future research is necessary to quantify the relative impact of key behavioural, cognitive and situational factors which impact at different levels of a safety culture in the generation of industrial accidents. The complex aetiology of accidents dictates an approach which can deal with the complexity of chaotic systems and impact of the process of discourse. One of the key areas for examination is the impact of power relations upon safety culture. One of the key failings encountered in the institution of effective management techniques (eg, Safety Management, BPR and TQM techniques) appear to be caused by the retention of power at the top of hierarchies preventing worker empowerment. Few safety studies consider the issue of power in accident causation. However, power relations materially affect safety through motivations, attitudes, decision making, allocation of resources, etc.

*Culture, power relations and political processes within organisations are important aspects for organisational behaviour. However, the relationship between power and safety has received little attention. Waring (1994)*

Waring (1994) concludes that the most risky aspects of an organisation may lie not in the physical hazards, but in the self-limiting behaviour associated with power and culture. Understanding the complexity of the relationships between factors and the relative importance of contributory factors to accident causation will widen the agenda and effectiveness of safety management. Further work needs to be done to verify the impact of cultural biases on safety culture and



confirm the validity of the societal biases in Caribbean culture. The safety discipline already considers physical aspects of biology and safety in terms of anthropometric and ergonomic considerations, but there is little work on the impact of sociobiological factors on safety culture. The impact of differences in economic class, work types and nature of organisation on values within societies needs to be assessed. Pidgeon (1998a) identifies uncertainty, power relations, organisational learning, and the social construction of risk as key issues for future safety culture research. Multidisciplinary research is needed to examine how:

- ♦ cultural theory can help explain why risk management strategies vary between organisations and between nations;
- ♦ power relationships influence safety culture;
- ♦ regulators can best influence organisational safety culture, particularly in small firms;
- ♦ socio-biological factors, (including response to climate), impact on safety culture;
- ♦ the influence Afrocentric values varies in different Caribbean societies over time;
- ♦ perceptions of control and time influence risk taking behaviour; and
- ♦ violations and risk perception are linked.

## 11.7 Summary

*Safety culture studies must now address the significant strides made in understanding and applying the concept - turning what has been simply a convenient phrase into a concept of practical value. Rosen (1995)*

Ryan (1991) found that key safety management performance indicators in the nuclear industry in the USA, are shared perceptions of goals at all levels of the organisation, good organisational learning and response to change and organisational focus on health and safety. Positive safety cultures are characterised by management commitment and the involvement of all employees. Individuals need to feel that they can stand up and say something is wrong rather than keep quiet. These process are characteristic of positive safety cultures and are poorly developed in much of the British and Caribbean construction industry where few organisations proactively manage communications, goal commitment, organisational learning, employee participation and thoroughly examine work practices to reduce risk. Attention to safety culture might help not only reduce the incident of accidents and disasters, but is also in the long term business interest of most organisations and society as a whole.

The safety culture paradigm is important because it moves us away from the scene of the accident into the socio-technical system as a whole. The notion of a socio-technical system stresses the close interdependence between people and their social arrangements and the technology hardware that they may make and use. People and technology interact with each other and, over time, change each other in complex and often unforeseen ways.

*the concept of the corporate safety culture provides one step towards understanding of the socio-technical aspects of system reliability, and for framing risk management strategies for improving safety. Pidgeon, Turner, Blockley and Toft, (1991)*

The industrial development of the Caribbean will inevitably lead to cultural changes. Caribbean people already complain about the growth of US values in their societies. The growth in the use of mechanised tools in the construction industry may result in high accident rates as identified by Aji (1997) in Indonesia. The risk management lessons learnt by the industrialised nations



need to be transferred into effective action in the Caribbean and around the rest of the globe. This requires a clear understanding of the nature of culture and positive effort at every level of the safety culture vortex.

## *Chapter Twelve: Conclusions*

*The ultimate barrier to excellence in safety is not regulatory or technical, but cultural.*  
Alves Dias and Curaden (1996) p26

The effective prevention of occupational accidents and ill-health is intimately linked with concepts of management, societal culture and risk. It is not therefore surprising that the concept of safety culture has remained vague and ill-defined. However, there is now sufficient work to show that positive aspects of safety culture are intimately linked with TQM and effective risk management. The history of the development of TQM around the world highlights the impact of societal cultural differences upon organisational culture. This chapter concludes this cross-cultural study of the safety culture of the construction industry in Britain and the Caribbean.

This study set out to examine the safety culture of the construction industry in Britain and the Caribbean by auditing physical aspects of site safety, assessing construction contractors safety management regimes, and measuring safety climate by scaling construction workers' attitudes to specific safety issues. It also examines external influences upon the safety culture of the construction industry, including regulation and societal culture. The wide ranging literature review on accident causation, organisational behaviour, safety culture, the construction industry, culture and the Caribbean informed the conduct and direction of this study. Cultural and sociological theory are incorporated into this holistic cross-cultural analysis of safety culture.

The nature of regulation, engineering technology, safety management, site safety and risk related attitudes and behaviours have common themes and distinct differences in the two regions. British hegemony, commonality of industrial process, and universal aspects of the human condition are key influences on the two safety cultures. Intermittent employment is a characteristic feature of the construction industry due to fluctuations in demands for buildings and structures, and the temporary nature of work sites



and economic swings. The construction process in the Caribbean is labour intensive, informal, flexible and comparatively relaxed. There is little evidence of levels of adversity or fragmentation present in the British construction industry, highlighted by Latham (1994). Poor management practices, subcontracting and fragmentation are features of both cultures. Anecdotal evidence suggests that theft and corruption are commonly encountered in the construction industry in both Britain and the Caribbean.

## **12.1 Site Safety**

The site safety audit identified significant differences in safety performance between British and Caribbean construction sites. The average site safety scores for sites in Britain was 71% while the Caribbean it was 57%. The scaffolding category (45%) and PPE category (33%) scored poorly on most Caribbean sites. Caribbean construction sites were in general clean and tidy as evidenced by the high scores achieved in the housekeeping category (78%). Access (70%) was generally good despite the fact that many ladders were made on site. These results correspond with the findings of Rowlinson and Linguard (1996) using the same measure in Hong Kong. Scaffolding for work at heights emerges as the most culturally influenced category on the UMIST site auditing tool and the hardest area to achieve changes in behaviour.

On Caribbean construction sites, the types of scaffolding and falsework props varied from proprietary metal systems to hardwood timber and bamboo. The audit scores reflect differences in the way in which scaffolds are constructed and used in the Caribbean compared to Britain. Edge protection to working platforms was generally lacking and boarding was incomplete. The provision of personal protective equipment was variable but generally poor in the Caribbean. Workers readily wore protective equipment, ie, hard hats, goggles, gloves, and face masks, when provided by the contractor. Caribbean managers often complained that the safety boots provided to workers are often sold or kept at home 'for best'. There is relatively little use made of hazardous

chemicals on Caribbean construction sites in comparison with Britain. This is due primarily to climatic and economic imperatives which result in the use of different construction techniques, including different materials, finishes and systems of work. The construction industry around the world is labour intensive, in comparison with other industries. In the Caribbean, labour is cheap compared with technology so the industry tends to use traditional labour intensive methods. Generally, there are low levels of mechanisation in the Region when compared with Britain, and the plant used is often poorly guarded and maintained.

The safety management regime and work practices on the Jubilee Line Extension Project (JLEP) were in stark contrast to the majority of construction projects both in the Britain and Caribbean. The scale of the project and the recent disaster experiences of the client engendered a proactive safety philosophy that contrasted and conflicted with many of the construction contractors' cultures. Extremely high scores were achieved on the site audits, which bear testimony to the fact that very high standards are achievable in the construction industry. From inspection experience over 18 months of the project these standards were artificially high. Site visits formed one part of extensive safety culture audits which had to be arranged in advance with the contractors. Site safety standards achieved by contractors on the project were well above the British average construction industry standards. However, unsafe practices common to the industry, were frequently observed on site.

## 12.2 Safety Climate

*Individual attitudes and motivations must be seen as informed, and at least partly determined by the particular physical, economic, and socio-cultural work context in which they are framed. Leather (1987) p167*

The commonality of response to the attitude scales between construction workers in Britain and the Caribbean samples is initially the most striking feature of this work. Factor analysis of the attitude data demonstrate that both samples considered safety to be primarily an interaction between managers



and workers. Workers' perceptions of risk, experience, sense of rushing and safety communications were important but secondary factors corresponding with the findings of Dedobbeleer and Beland (1991). These findings highlight the importance of the management/worker relationship, particularly issues such as trust and communications.

Construction workers in the Caribbean produced higher mean scores than the British sample on the UMIST Safety Climate Scale and Leather's Attitude Scale. The UMIST Safety Climate Scale revealed that Caribbean workers have less positive attitudes with regard to management behaviours, but are more positive with respect to the foreman's and their own actions with respect to safety, than evident in the British sample. On Leather's Attitude Scale Caribbean workers scored highest the items relating to the benefits of experience, and the view that risk taking is an individual's personal choice. The sample of Caribbean construction workers achieved higher scores on Leather's scale of internal locus of control than the British sample.

### 12.3 Industry Characteristics

The British construction industry is characterised by adversity, bonus schemes, competition and tight time schedules. Latham (1994) describes the British construction industry as litigious with adversity, conflict, fragmented organisation and a lack of trust. Compared with Britain there is not the same degree of 'cut-throat' competition or close supervision of labour or the same degree of subcontracting. Practical difficulties in materials and equipment supply, financing projects, limited access to training, unreliable infrastructure and the small size of local markets limit competition in the Caribbean construction industry. In the Caribbean the time scales set for construction project completion are generally more generous than in Britain. A quantity surveyor working in Trinidad, who had spent ten years working in Britain, described Caribbean companies as *not as clued up* in relation to cost-effective

procurement and scheduling of works. This phrase reflects the relative lack of detailed cost accounting methods for materials and labour management on site.

Construction companies in the Caribbean did not formally manage safety. Safety related policies, committees and documented management systems are rare. Site managers in the Caribbean who had worked in Britain stated that they had to carry out a far greater degree of control of day-to-day site activities due to the lack of engineers, skilled tradesmen and supervisors. Directors and project managers were often unaware of their duties under health and safety legislation. Caribbean construction companies have slim management structures, with little bureaucracy. The small and medium sized contractors, which dominate the British construction industry, have similar characteristics.

Bonus schemes, tight time schedules, penalty clauses and litigation were uncommon in the Caribbean. Caribbean managers stated that workers valued the duration of employment higher than the opportunity to increase earnings by increasing work pace. Workers tend to be multi-skilled, rather than specialise in one particular trade. Caribbean construction workers often go missing from site work for several weeks to tend their farms and enjoy the fruits of their labour. The British workforce tends to work for a greater proportion of the year compared to Caribbean workers. The degree of trade specialisation was greater in Britain, ranging from specialists such as compressed air workers, compensation grouters, tunnellers, etc., who travel around the world working, to local carpenters, masons, steel fixers, and labourers employed by local labour barons.

## **12.4 Regulation**

Occupational health and safety legislation established during the later days of colonial rule was present in all the Caribbean countries studied, except for Anguilla. Subsequent changes to the legislative framework for health and safety have been made in several Caribbean countries. The impact of government health and safety agencies in the Caribbean is often minimal, due



to the problems which El-Bitawi (1981) identified in most developing countries. Inspectors are rarely provided with legal powers of prohibition and prosecution, or with adequate technical equipment, and means of transport. On the whole they are underpaid, handicapped by bureaucracy and excessive delays in judicial proceedings and the low level of legal penalties for violations.

Occupational health and safety legislation applicable to construction in the Caribbean varies from country to country, is proscriptive and rarely enforced. The regulatory system for occupational health and safety in Britain is extensive and complex. HSE inspectors have powers of immediate prohibition, improvement and prosecution. An average of one hundred inspectors were devoted to inspect the construction industry in the 1990s. Regulations forming a comprehensive regulatory framework covering the whole construction process. HSE construction inspectors conduct more formal enforcement work in construction than in any other industrial sector. From available reported data for accident numbers and causation for the Caribbean, accident rates in all industry and the construction industry are substantially less than those in Britain.

## **12.5 Societal culture**

Many Caribbean construction workers, particularly in the less developed or rural areas, live by combining construction work with small hold farming commonly referred to locally as *planting a garden*, or hunting in the more mountainous areas. Workers will often not turn up for work on site for a few weeks so they can attend to their land. Alternative methods of income generation and survival, outside formal employment, are features of the Caribbean lifestyle for many manual workers. Unemployment levels of around 20% and intermittent employment are characteristic features of Caribbean economies. Multi-skilling, infrequent periods of formal employment, the extended family, tropical climate and widespread poverty effectively reduce the pressures to maintain full-time employment.

In the Caribbean, time is less of a pressure, production related bonus schemes are generally absent and work pace is relatively slow, compared with Britain. Workers feel a personal responsibility for their own safety and take their time to work safely in an often hazardous work site environment. Positive worker attitudes to safety and aspects of human relations on site and in society, allied with environmental factors such as scale of works, low levels of technology and work pace, effectively reduce risks and therefore accident frequency in the Caribbean construction industry. However, the increasing influence of US corporate culture has an impact on the Caribbean construction industry, with tightest time schedules experienced by projects commissioned and managed by expanding US fast-food retail chains and finance companies.

African-Caribbean people dominate the manual trades in construction industry of the region. The degree of influence of Afrocentric values and their impact on the modern Caribbean societies is an issue which has provoked much debate because of the history of European hegemony. African cultural characteristics are particularly noticeable in the less developed economies and rural areas. Many Caribbean construction workers live in extended families, have few material possessions, place great emphasis on human interaction, dance, music, fertility, and African inspired religious beliefs. The holistic aspect of Afrocentric philosophy is evident in the often repeated phrase in the Caribbean *everything is everything*. Attitude scale items relating to interactions with fellow workers, communications on site and enjoyment of work were all scored highly by Caribbean workers. The Caribbean culture is ultimately a complex mixture of influences which has features of both African, Asian and European influences which vary in importance from location to location.

Positive attitudes towards risk taking, materialism, individualism, hierarchy and technology are central tenets of the British industrial culture. The dominant rational positivistic paradigm has created a culture of technocracy and severe managerial and communications problems (Smith, 1998). These problems are not conducive to development of positive risk management



culture that requires humanistic management styles, open communications and commitment to loss control. The tendency for individualistic cultures to blame individuals for accidents has its roots in the societal bias towards individuality, which is a feature of modernity (Rosen, 1995). The low uncertainty avoidance bias of Britain is associated with individualism, risk taking and blame (Hofstede, 1980). The individualistic bias of the Britain encourages risk taking, while its hierarchical bias tempers risk taking with expert input (Thompson, Ellis and Wildavsky, 1990).

Eurocentric culture, is individualistic, divisive, materialistic in its nature and places emphasis on science, technology, time and money. In contrast, Afrocentric culture is founded on holistic humanistic and spiritual ideals. Rokeach (1973) found that the value of loving is highly ranked in non-industrialised cultures while ambition is highly ranked in industrialised cultures. Work is concerned with control, discipline and future goals, where as love is about freedom, receptivity, submission and the present. Chhokar (1987) refers to the concentration on engineering approaches to safety in the health and safety systems in European countries. Traditionally, British safety culture is biased to engineered safeguards and the formulation of work rules (HSC, 1993).

Watson (1996), looking at the construction industry from the postmodern view, considers the majority of the British construction industry's major players follow modernist theory assuming that change is a linear process and therefore can be managed in an incremental way. It is a belief in simple cause and effect relationships which is a strong cultural bias in the Britain. To improve the risk management culture of the British construction industry there is a need for a shift towards collective, synthesising, particularistic, outer directed and feminine values. This requires a cultural shift away from individualistic attitudes and behaviours. Risk taking as a cultural value needs to be tempered by the philosophy of risk management. Time needs to be seen as an ally as well as a cost and scarce resource. These changes are necessary if modernism is to

become reflexive following Giddens and Bourdieu, and save people from the negative effects of the current culture.

This research examines the impact of societal culture upon safety culture of the construction industry. The key to improving risk management is the recognition of the negative impact of specific cultural biases and the institution of measures to counter them. Societal cultural biases can have a significant impact upon safety culture. Conceptions of time, human relations, materialism and risk taking emerge as important societal factors which impact on safety culture. Legislation, economics, lifestyle, religion and history also impact on safety culture.

Holistic models of accident causation and safety culture emerge from this work. The models of accident causation, safety culture vortex and organisational safety culture derived from this work are dynamic, interactive and multifaceted. They include the influences of industrial and societal culture which are neglected in the majority of accident causation and safety culture models. These models illustrate the complexity of the accident causation process and nature of safety culture.

The most significant hazard on Caribbean construction sites is the lack of edge protection. However, from the data available, falls from height do not appear to be such a problem as they are in Britain. Following Hinze's (1996) *Distractions Theory of Accident Causation*, worker productivity is reduced in the Caribbean due to the need to focus both on work task and ensuring personal safety due to hazardous conditions, ie lack of edge protection. However, the accident causation process is far more complicated than allowed for in Hinze's model. Other factors include fear of heights, locus of control, work pace, previous experience and climate. The example of falls from heights highlights how differences in lifestyle due to differences in industrial development, impact on accident causation and safety culture.



## 12.6 Closing remarks

*The real challenge to remove the accident plateau is to start to try and change societal cultural bias. Rosen (1995)*

The concept of risk blurs the distinctions between theory and practice, specialities and disciplines, competencies and institutional responsibilities, value and fact (and thus between ethics and science), and crosses the realms of politics, science and economics (Beck, 1992). In short, risk and risk management are integral aspects of societal culture. Cultural preferences or values are key sources of national identity. However, little work has yet surfaced on the concept of safety culture at the national level despite the fact that cultural origin is one of the most important determinants of values (Hofstede, 1980; Hampden-Turner and Trompenaars, 1993).

The development of a robust risk management culture at the nation, industry and organisational levels requires a balance of cultural bias. It is what a culture lacks, rather than what it has, that is important to consider. Individualistic cultures need to adopt more collective attitudes and behaviours to improve human relations. Authoritarian cultures need to empower workers to reduce power distances. The most successful organisations and societies of the 21st Century will be those that overcome their cultural biases to achieve the best balance of all values and behaviours (Hampden-Turner and Trompenaars, 1993).

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# Appendix One: Construction Accident and Ill-health Statistics

## 1.1 Caribbean Data

### *Trinidad and Tobago*

Industrial accident data are published by the Central Statistical Office from the records of the number of accidents reported to the Factory Inspectorate under the Factories Ordinance. Between 1987 and 1992 the annual number of reported fatal accidents for all industry ranged between two and six, with an average of four per year, while nonfatal accidents for all industry declined from 921 to 660 in the same period (CSO, 1995). The all industry fatal accident incidence rate in Trinidad and Tobago fluctuated between 0.5 and 1.6, while the nonfatal accident incidence rate declined from 248 in 1987 to 163 in 1992 (see table A1.1).

Table A1.1 All Industry Accident Data 1987-1992 Including Incidence Rates (per 100,000) Source CSO Trinidad and Tobago 1995					
Year	Nos Employed	Fatal Accidents	Fatal Accident Incidence Rate	Nonfatal accidents	Nonfatal Accident Incidence Rate
1987	372,100	2	0.5	921	248
1988	371,500	6	1.6	821	221
1989	365,700	5	1.4	695	190
1990	374,100	2	0.5	748	200
1991	401,000	4	1	699	174
1992	405,900	4	1	660	163

Between 1987 and 1992 there were no fatal accidents reported in the construction industry, while the annual number of nonfatal accidents ranged between none and six. Underreporting of accidents in the construction industry must be considered significant in light of these figures particularly considering the numbers of accidents recorded in the late 1970s (see Suite, 1997) and the fact that there were no nonfatal accidents reported in 1991 and 1992 (see table A1.2). Comparable data were not available from the two workers compensation schemes.

The Annual Statistical Digest (CSO, 1995) contains accident causation data for all industrial accidents, but does not break down figures for the construction industry. Between 1987-1992, industrial activity in Trinidad and Tobago resulted in:

- ♦ ten fatal electrical accidents accounting for 43% of fatal accidents and 45 nonfatal accidents (1%);
- ♦ five fatal 'struck by' and 'step on' incidents accounting for 22% of fatal accidents and 1753 nonfatal accidents (accounting for 39% of the total);
- ♦ four fatal trapping incidents accounting for 17% of fatal accidents and 636 nonfatal accidents (accounting for 14% of the total); and
- ♦ three fatal falls accounting for 17% of fatal accidents and 506 nonfatal falls accounting for 11% of nonfatal accidents.

Table A1.2

**Accident Incidence Rates (100,000) for the Construction Industry in Trinidad and Tobago (source CSO 1995)**

Year	Employment in construction	Fatal accidents	Nonfatal accidents	Nonfatal accident incidence rate
1987	48,100	0	2	4.2
1988	40,000	0	6	15
1989	38,000	0	2	5.3
1990	39,700	0	1	2.5
1991	45,400	0	0	0
1992	43,900	0	0	0

### *Saint Vincent and the Grenadines (SVG)*

Occupational accident data were available from reports submitted to the Labour Department and published in the Labour Market Information Bulletin. The total number of reported occupational accidents for the years 1988 to 1991 ranged between 15 and 32, with an annual average of 24. The construction industry accounted for between 60 and 83% of reported accidents between 1988 and 1991. The all-industry all-accident incidence rates for paid employees in the industrial sector in SVG between 1988 and 1991 varied between 190 and 400. The Labour Market Information Bulletin (Volume 3, 1990) details reported industrial accidents by cause, but does not give a break down by industry. Machinery accidents were the most common form of reported accidents accounting for 35% of accidents between 1988 and 1990. In this period falls accounted for 20% of accidents while struck by incidents accounted for 17% accidents.

From an analysis by the author of construction accident reports between 1988 and 1991, 'struck by' incidents accounted for 30% of accidents while machinery accidents, vehicle accidents and slips trips and falls each accounted for 20% of nonfatal reported accidents. Between 1988 and 1991 one fatal accident was reported in the construction industry when a worker was electrocuted in 1991 producing a fatal accident incidence rate of 29. In the construction industry the all-accident incidence rates for paid employees ranged between 293 and 675.

Forty-five percent of the accidents reported by the construction industry in SVG were from one company owned by a Swedish architect operating on the privately owned island of Mustique. This company employed up to 400 construction workers building luxurious holiday homes for the rich and famous. Workers regarded them as strict disciplinarians who pressured them to finish work quickly and paid bonuses for early. Workers stated that time and production pressures were greater here than in Saint Vincent, with a greater degree of on site supervision. Of the thirty-three reported accidents, only four could be classified as major accidents, all involving fractures of bones. This apparent glut of accidents may well be due to the combination of a well developed accident reporting and sickness claims procedure and a relatively poor safety performance due to emphasis on speed and production.

Analysis of accident report forms supplied to the Labour Department showed that the construction industry accounts for on average 71% of all reported accidents in SVG between 1988 and 1991. With the construction industry being the third largest formal employment sector and the largest industrial employment sector this figure is not surprising with the two



leading employment sectors being white collar sectors. The construction industry reported an average of 17 accidents per year, compared with an all industry average of 24 (see table A1.3).

Table A1.3

**Accidents reported to the Labour Department in SVG**

Source: Ministry of Labour

Year	All Reported Accidents	Construction Accidents
1988	15	10
1989	29	23
1990	32	19
1991	18	15

*Barbados*

There was no published source of accident statistics available in Barbados in 1992, however, the researcher was allowed access to the records of the Labour Department. Records of the number of accidents reported to the Labour Department between 1988-1991 are summarised in table A1.4). The total number of reported accidents varied from a high of 70 in 1989 to a low of 22 in 1990. Two fatal accidents reported by Barbadian industry in both 1989 and 1991, one of which occurred in the construction industry in both years. The construction industry fatal accident incidence rate for these two years was 11 and 12 respectively. The construction industry accounted for between two and seven% of nonfatal accidents. Being struck by falling objects was the most common cause of construction accidents accounting for around 40% of all reported accidents, while falls accounted for 16% of reported accidents and trapping accidents accounted for eight% of reported accidents.

Table A1.4

**Fatal and nonfatal accidents reported to the Labour Department in Barbados  
1988-1991**

	1988	1989	1990	1991
All Industry Fatal Accidents (inc construction)	0	2	0	2
<b>Construction Industry Fatal Accidents</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>
All Industry > 3-day absences	744	1,120	959	812
<b>Construction Industry &gt; 3-day absences</b>	<b>52</b>	<b>70</b>	<b>22</b>	<b>27</b>
Employees in Construction (%)	9	10	9	8
Employees in construction	9,300	10,900	9,600	8,500
Labour Department Figures - construction industry fatal accident incidence rate	0	11	0	12

*Saint Lucia*

Occupational accident data for Saint Lucia were not readily available. The Labour Department in St Lucia did not collect occupational accident or ill-health data. The Labour Market Information Bulletin (1988) contained accident data from the National Insurance Scheme figures. The NIS had not published annual reports since 1988, however, NIS staff made available the data for the years between 1988 and 1991. In 1991 the construction and manufacturing industries both accounted for 8% of gross domestic product. The construction

industry accounted for 10% of the working population, but only 4% of NIS contributions. The NIS had 2165 construction workers registered, compared with the population housing census total of 4,500 persons employed in construction in 1991. The construction industry made thirty-six employment injury claims to the NIS in both 1990/91 and 1991/92. Anecdotal evidence from staff within the NIS suggests that there were no fatal accidents reported by the construction industry between 1989 and 1991. However, two water authority workers died in an excavation collapse in 1991.

### *Anguilla*

No occupational injury data were available in Anguilla. Data from social security scheme sickness benefit payment records did not differentiate between natural ill-health and payments made due to work injuries. However, in conversation with government and construction workers, no-one could recollect any serious accidents, and certainly no fatal accidents occurring in Anguilla between 1987 and 1992.

### *Jamaica*

In Jamaica both the Industrial Safety Division (ISD) of the Ministry of Labour and the NIS collected data relating to occupational accidents. Both organisations had suffered major financial cutbacks and comprehensive, up-to-date information, was not readily available. All accidents resulting in more than 48-hour absences from work are reportable under section 14 of the Factories Law 1956. The Industrial Safety Division of the Ministry of Labour, Welfare and Sport, received reports of accidents from premises covered by Factories Act legislation. Between 1987 and 1992 there was an average of 123 accidents reported annually to the ISD. The average all-accident incidence rate over this period was 230 (see table A1.5). Falls were the cause of the majority of accidents reported by Jamaican industry accounting for an average of 34% of all reported accidents between 1987 and 1992.

Table A1.5

#### **Accidents reported to the ISD in Jamaica 1987-1992**

*source: Ministry of Labour Statistical Bulletins*

	1987	1988	1989	1990	1991	1992
Accidents Reported	168	130	100	126	106	108
Number of Factories	1,372	1,431	-	-	1,334	1,366
Number of employees	55,596	55,785	-	-	52,157	60,473
All-accident all-industry incidence rate	302	233	-	-	203	179
Fatals	-	-	-	-	-	2 (1 in const)

No accidents were reported to the ISD by the construction industry in 1985, 1988, 1991 and 1992. The construction industry reported two falls and two accidents involving lifting machinery in 1987, and three falls and one lifting machine accident 1986. Under-reporting of accidents by the construction industry to the ISD under factories legislation, is endemic. Construction industry accident data were not recorded as a separate category. In 1992 the researcher took part in the investigation of a fatal accident resulting from the electrocution of a worker in the construction industry while working for the ISD. In 1992 there were 108 accidents and 60,000 workers employed in factories, giving an all-industry all-accident incidence rate of 180. The sugar industry accounts for the highest number of accidents and is the largest employer of manual labour.



## Guyana

The Ministry of Labour and the NIS provide sources of industrial accident data in Guyana. The Ministry of Labour received reports for accidents that cause over one-day absences from work. The NIS deals with claims resulting in greater than three-day absences from work. The Ministry of Labour receives accident reports under the Accidents and Occupational Diseases (Notification) Act 1955. The Act has a list of prescribed occupational diseases including anthrax and metallic poisoning, but does not prescribe any dangerous occurrences. The sugar industry dominates the Guyanese economy and reports the bulk of industrial accidents. No data were available specifically for the construction industry. In the early 1990s the annual number of reported fatal accidents in Guyanese industry ranged between three and eight (Table A1.6).

Table A1.6

### Fatal and Nonfatal Accidents (over one-day absences) in Guyana 1987-1993

source Ministry of Labour

Industry	1,987	1,988	1,989	1,990	1,991	1,992	1,993
SUGAR	8,637	8,912	9,902	11,745	13,525	13,905	14,983
BAUXITE	393	414	320	370	295	258	260
OTHER Industry	35	72	28	35	239	192	768
FATALS	-	-	3	4	3	4	8

In the early 1990s an average of 40 self-employed and over 400 employed construction workers registered with the NIS, reflecting the relative low degree of self-employment compared with BRITAIN construction industry. Self-employment in all industries averaged ten%. The construction industry accounted for seven death benefit claims in the eight years between 1985 and 1992, 6% of the 121 total death benefit claims. Inspectors considered that the sugar industry was plagued by workers deliberately injuring themselves to get NIS payments. Claims for death benefit through the NIS include causes such as shooting, stabbing, road traffic accidents, etc. Between 1987 and 1989, over 80% of all NIS claims were made by the sugar industry.

Little economic employment data were available in Guyana, and the number of employees in construction was not available for the early 1990s. The number of economically active people in 1987 was 270,074, 3% of whom worked in the construction industry (Encyclopaedia Britannica, 1993). The total number of construction workers was therefore approximately 9000. Using this figure for employment, and the NIS number of accident claims in construction, the all-accident incidence rate between 1989 and 1991 averaged 140 for construction and 1250 for all industry.

## 1.2 British Data

In the mid 1990s the enforcing authorities in Britain annually received around 400 fatal work accident reports (RoSPA, 1996). If fatalities due to occupational road accidents are included, this figure increases by 1000. The Labour Force Survey estimates that every year there are around 1.6 million injuries and about two million cases of ill-health either caused or made worse by working conditions. There are estimated to be over 10,000 early deaths due to past exposures to hazardous agencies at work such as asbestos. The annual cost to employers is estimated to be between £4 to £9 billion. The cost to Britain as a whole may be as high as £11 billion or nearly 3% of gross domestic product, but the human cost to victims, their families, relatives and friends cannot be quantified (RoSPA, 1996).



The Reporting of Injuries, Diseases, and Dangerous Occurrences Regulations (1995) (RIDDOR), require the reporting of all occupational injuries and cases of ill health resulting in greater than three day absences from work. Employers, the self-employed, and persons in control of premises should send reports to the Health and Safety Executive on prescribed forms. HSE compiles data for reported accidents by industry, nature of injury or disease, and employment status. From comparisons with data from the Labour Force Survey, less than 50% of RIDDOR work accidents are reported to HSE. The construction industry is particularly poor at reporting accidents due, in part, to the persistence of informal employment practices.

There has been a general decrease in the number of work related fatal accidents in British industry in the 1990s. Numbers fell from 473 at the start of the 1990s to 338 in 1995/96. However, numbers increased by around ten% across industry in Britain in 1996/97. The construction industry accounts for one third of all work related fatal accidents in Britain and accounts for the second highest number of fatal accidents by industry. The number of fatal accidents in the construction industry mirrored the general decline shown in British industry with reduction of almost 50% from 153 in 1989/90 to 79 in 1995/96. However, in 1996/97, the number of fatal accidents rose to 92. While the number of fatal accidents decreased in the 1990s, the fatal accident incidence rate (per 100,000), for all British industry has remained fairly constant, averaging around one, which is one of the lowest in the world. The construction, agriculture and energy sectors have the highest and most variable rates. The fatal accident incidence rate for employees in construction is the highest of the industrial sectors averaging eight in the 1990s. The construction industry fatal accident incidence rate, for all workers, is three times the all industry rate. The construction industry fatal accident incidence rate for all workers fell through the early nineties from around six to under five, but showed an increase in 1996-97 to 5.6.

High falls (>2m) account for almost half of all construction fatal accidents in the first half of the 1990s. Accidents caused by transport and collapse incidents account for a third of all construction fatal accidents. Machinery and manual handling accidents, exposures to toxic substances and electrocutions, are relatively infrequent causes of death in Britain construction industry. There was a general downward trend in the numbers of major accidents reported through the 1990s. The numbers of major accidents in the British construction industry declined through the early 1990s from around 4000 at the end of the eighties to around 2500 in the mid nineties. This trend reversed with significant increases across all sectors in 1996-97. The number of major accidents reported in the construction industry rose by over 60%. This increase is partly attributable to the new reporting requirements of RIDDOR 1995 which changed the definition of a major accident, and an increasing awareness of legal duties due to the introduction of two major new sets of legislation in construction (CDM and CHSW). The all industry accident incidence rate showed a steady marginal decrease between 1987-88 and 1995-96 falling from 94 to 77, then a spectacular increase in 1996-97 to 125. The rate for construction rose between 1987-88 to 1989-90 from 276.5 to 298.9, then fell to a low of 77.1 in 1995-96. In 1996-97 the major accident incidence rate for the construction industry rose by around 60% to 125.8. Sixty% of major accidents are caused by falls and trips. Struck by accidents and manual handling account for 20% of major accidents.

The numbers of reported greater than three day accidents reported by the construction industry fell from over 18,000 at the beginning of the decade to under 10,000 by 1995/96. The Labour Force Survey (1992) estimates suggest that the real number of minor injuries is at least double the number reported. The over three day accident rates for British industry averaged 557 through the first half of the nineties. The construction sector incidence rate has consistently been over ten% higher than the all industry figure averaging 680. Rates for the construction industry showed only a slight increase in 1996-97. The marked difference between the construction accident rates compared to all industry rates for fatal and major accidents is not apparent for three day injuries which may well be a reflection of underreporting. Manual handling accidents are the leading cause of over three day accidents in the industry accounting



for one third of reported over three day accidents. Trip, struck by and combined falls account for over 50% of over three day accidents.

# Appendix Two: Data Collection Tools

## A2.1.1 UMIST Site Safety Audit Tool

SITE: ..... OBSERVER:.....

WEEK: ..... DATE: .....

TIME OF VISIT (CIRCLE RELEVANT NUMBER)

- |                     |                    |
|---------------------|--------------------|
| (1) EARLY MORNING   | (2) LATE MORNING   |
| (3) EARLY AFTERNOON | (4) LATE AFTERNOON |

NUMBER OF OPERATIVES ON SITE - DIRECT).....  
- (SUB CONTRACT) .....

(CIRCLE RELEVANT NUMBER/S)

- (1) GENERAL OPERATIVES (2) BRICKLAYERS (3) PLANT OPERATIVES (4) SCAFFOLDERS  
(5) GROUND WORKERS (6) ROOFERS (7) STEEL ERECTORS FIXERS (8) PAINTERS  
(9) SERVICES - PLUMBERS, LIFT ENGINEERS, (10) OTHER .....

WEATHER (CIRCLE RELEVANT NUMBER)

- |                             |                          |                      |
|-----------------------------|--------------------------|----------------------|
| (1) OVERCAST, WET AND WINDY | (2) SUNNY, WET AND WINDY | (3) OVERCAST AND WET |
| (4) SUNNY AND WET           | (5) OVERCAST AND WINDY   | (6) SUNNY AND WINDY  |
| (7) SUNNY AND DRY           | (8) SUNNY AND WARM       | (9) WARM             |
| (10) HOT                    | (11) OVERCAST            | (12) FROSTY          |

WHAT ACTIVITIES ARE OCCURRING? (CIRCLE RELEVANT NUMBER: IF MORE THAN ONE ACTIVITY, CIRCLE MORE THAN ONE NUMBER)

- (1) GROUND WORK INC DRAINS AND FOUNDATIONS (2) CONCRETE POURING FOUNDATIONS  
(3) SCAFFOLDING (4) WALL STRUCTURE :WHAT FLOOR ABOVE GROUND?  
(5) CONCRETE POURING FLOORS: WHAT FLOOR ABOVE GROUND?  
(6) ERECTION OF STEELWORK WHAT FLOOR ABOVE GROUND? (7) ROOFWORK  
(8) FINISHING, INC PAINTING (EXTERNAL) (9) FINISHING, INC PAINTING (INTERNAL)  
(10) OTHER .....

WHAT TYPE OF PLANT IS ON SITE (CIRCLE RELEVANT NUMBER)?

- (1) MOBILE CRANE (2) TOWER CRANE (3) JCBs (4) DUMPERS (5) CONCRETE PUMPING EQUIPMENT  
(6) EARTH MOVING EQUIPMENT (7) CONCRETE MIXING PLANT (8) MOBILE ELEVATING WORKPLATFORMS  
(9) WELDING EQUIPMENT (10) MECHANICAL CUTTING EQUIPMENT

HOW MANY SUPERVISORS/SITE AGENTS ARE ON SITE DURING THIS VISIT?.....  
ANY VISITS BY:

- |                            |     |    |
|----------------------------|-----|----|
| (1) COMPANY SAFETY OFFICER | YES | NO |
| (2) GOVT. SAFETY INSPECTOR | YES | NO |



## UMIST SITE SAFETY AUDIT

HOUSE-KEEPING CATEGORY

0	1	2	3	4	5	6	7	8	9	10	X
none	scarcely	very	a	some	a considerable	alot	a great	an extreme	almost	all	NOT SEEN
	any	few	few		amount of	of	deal of	amount of	entirely		

**1. What proportion of timbers left lying around, have nails left in?**

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- (v) Look for nails that have not been taken out or bent over and hammered flat.
- (b) Look for timbers with protruding nails, left lying around, but ignore timbers that are stacked neatly and/or in skips.

**2. What proportion of openings are left uncovered or unguarded?**

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- (v) Look for any opening that is left uncovered/unguarded.
- (a) Openings in the floor should be covered with 25mm plywood or have a guardrail around it.
- (b) Openings in walls should be guardrailed off if below waist height (external) or where there is a drop next to it (internal).

**3. What proportion of walkways, access routes and staircases are littered with rubbish/debris?**

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- (v) Look for rubbish debris on all areas of the site, including all floor levels.
- (a) Walkways, access routes and Staircases should be free from rubbish debris?

**4. What proportion of stored materials are stacked/stored unsafely?**

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- (a) Look for brick pallets that are stacked higher than two high.
- (b) Look for timbers and steels that are not stacked or stored neatly on 'bites'
- (c) Look for materials that are stacked more than 2m high.
- (d) Look for materials that are stored next to open trenches or excavations
- (e) Look to make sure 'access' gaps are provided between stacks of materials.
- (f) Look for stacks that are unstable and or overhanging.

**5. What proportion of operatives have you seen throwing down objects from heights?**

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- (v) Look for any person throwing down any object.

**6. What proportion of scaffold lifts are littered with rubbish/debris?**

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- (x) Look for broken bricks, old mortar boards, used timbers, old paint tins, dried concrete, plastic sacks etc.

$\%S.P.L = [ 1 \quad \quad \quad ] 100 = \quad \%$
--

## UMIST SITE SAFETY AUDIT

### SCAFFOLDING CATEGORY

0	1	2	3	4	5	6	7	8	9	10	X
none	scarcely	very	a	some	a considerable	alot	a great	an extreme	almost	all	NOT SEEN
	any	few	few		amount of	of	deal of	amount of	entirely		

#### 1. What proportion of incomplete scaffolds are without warning signs?

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- (v) Look for incomplete scaffolds without warning signs.  
 (a) Warning notices should be displayed on partially completed scaffolds.

#### 2. What proportion of work scaffold platforms have missing boards?

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- (v) Look for any working platform which is not fully boarded.  
 (l) Do NOT include missing 'toeboards' in this question.  
 (a) No boards should be missing at all.

#### 3. What proportion of scaffold boards are placed incorrectly, causing a 'trap'?

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- (v) Look for scaffold boards not placed correctly on transoms.  
 (a) The ends of boards should be placed on transoms, with no more than 250mm (9") and a minimum of 50mm (2"), overhang.  
 (b) Bevelled pieces of wood fitted where necessary to prevent tripping.  
 (c) The maximum gap between boards is 25mm (1").  
 (d) Boards should be in good condition, ie not split or warped.

#### 4. What proportion of toeboards are missing on working scaffold platforms?

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- (v) Look for missing toeboards on any working platform.  
 (a) Toeboards should be 150mm (6") high - usually a scaffold board.  
 (b) Toeboards should be fixed inside the standards with clips.

#### 5. What proportion of guardrails are missing on working scaffold platforms?

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- (v) Look for missing guardrails on any working platform.  
 (a) Guardrails need to be provided where persons are liable to fall 2 metres (6.5ft) or more.  
 (b) They should be fixed at waist level height.  
 (c) They should be fixed inside standards.

#### 6. What proportion of scaffolds/formwork have missing baseplates under the standards?

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- (v) Look for missing baseplates.  
 (a) All standards should have baseplates.

$\%S.P.L = [ 1 \text{ ————— } ] 100 = \quad \%$
---



## UMIST SITE SAFETY AUDIT

### ACCESS TO HEIGHTS' CATEGORY

0	1	2	3	4	5	6	7	8	9	10	X
none	scarcely	very	a	some	a considerable	alot	a great	an extreme	almost	all	NOT SEEN
	any	few	few		amount of	of	deal of	amount of	entirely		

#### 1. What proportion ladders are too short for the job?

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

(a) Look for ladders that extend less than 5 rungs above the landing place.

#### 2. What proportion of ladders are used without being tied or secured?

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

(a) Look for ladders that are not securely fixed with clips or lashed near the top.

#### 3. What proportion of ladders are used unsafely?

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

(a) Look for ladders not on a firm, level base, supported on each stile and prevented from sagging or swaying.

(b) Look for more than one person on a ladder at any one time.

(c) Look for people over-reaching while on ladders.

(d) Look for persons re-positioning ladders by 'jumping' while standing on rungs

(e) Look for people footing ladders. This is only allowed if they are under 5m (16' 16") and cannot be fixed or lashed.

(f) Look for ladders not at the correct angle - (75 degrees) - 1 horizontal to 4 vertical.

(g) Look for persons carrying materials up a ladder which does not allow at least one hand on the ladder.

#### 4. What proportion of ladders are placed with broken or defective rungs?

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

(a) Look for any ladder with broken and or missing rungs as they should not be used.

#### 5. What proportion of trestles and ladders are being used on the working platform of scaffolds, without being firmly braced and fixed to the scaffold?

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

(v) Look for any trestle being used, which is not fixed to or braced against the main scaffold.

#### 6. What proportion of operatives are climbing up or down the outside of scaffolds?

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

(v) Look for anybody climbing up down the outside of scaffolds.

(a) Everybody should use ladders or other means of safe access.

(b) No person should climb up down the outside of a scaffold.

$\%S.P.L = [ 1 \quad \quad \quad ] 100 = \quad \%$
--

## UMIST SITE SAFETY AUDIT

### PROTECTIVE EQUIPMENT CATEGORY

0	1	2	3	4	5	6	7	8	9	10	X
none	scarcely	very	a	some	a considerable	alot	a great	an extreme	almost	all	NOT
	any	few	few		amount of	of	deal of	amount of	entirely		SELN

**1. What proportion of the operatives on the site are not wearing hard hats?**

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- (x) Look for anybody not wearing a hard hat.  
 (a) The exception is in site huts

**2. What proportion of the operatives on site are not wearing goggles or other items of eye protectors when using motorised cutting equipment/cartridge operated tools?**

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- (x) Look for anybody not wearing goggles.

**3. What proportion of operatives are not using ear defenders while using noisy equipment?**

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- (x) Look for any person not using ear defenders while using noisy equipment'

**4. What proportion of operatives are not wearing face masks in dusty conditions?**

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- (x) Look for any operative not wearing face masks while working in dusty conditions  
 (a) Face masks should be worn in confined spaces where there is a lot of dust

**5. What proportion of operatives are not wearing gloves while handling materials have sharp edges and could cause skin problems?**

1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	----	---

- (x) Look for operatives not wearing gloves while using releasing agents on shuttering hot tar or similar products and materials with sharp edges or other harmful substances

**6. What proportion of personnel are not wearing protective footwear?**

0	1	2	3	4	5	6	7	8	9	10	X
---	---	---	---	---	---	---	---	---	---	----	---

- x Look for operatives wearing trainers casual shoes while on site

$\%S.P.L = [ 1 \text{ --- } ] 100 = \%$
---



### A2.1.2 JLEP Site Audit Tool

#### HEALTH MATTERS

none scarcely very a some a considerable alot a great an extreme almost all NOT  
any few few amount amount entirely SEEN

##### 1. NOISE MANAGEMENT

What proportion of noisy (>85dBA) operations have been assessed and controlled

0 10 20 30 40 50 60 70 80 90 100 X

*Look for zoned areas, and ppe provided and worn.*

##### 2. COSHH

What proportion of chemicals and substances have been assessed and their use controlled

0 10 20 30 40 50 60 70 80 90 100 X

*Look at grouts, accelerators, adhesives and cement  
Look at dust monitoring and control  
Look at use of PPF*

##### 3 VENTILATION AND GAS MONITORING

What proportion of work stations have adequate ventilation and gas monitoring

0 10 20 30 40 50 60 70 80 90 100 X

*Look for FV close to work faces. Look for working Gas Monitors*

##### 4. WELFARE

What proportion of work locations have the required welfare facilities

0 10 20 30 40 50 60 70 80 90 100 X

*Look for numbers of toilets and washing stations and their condition*

##### 5. MANUAL HANDLING

What proportion of hazardous (>25Kg man) operations have been assessed and controlled

0 10 20 30 40 50 60 70 80 90 100 X

*Look for assessments and control measures to reduce the potential for musco-skeletal injury*

##### 6. FIRST AID

What proportion of work locations have trained first aiders and first aid equipment present.

0 10 20 30 40 50 60 70 80 90 100 X

ITEM	+	-	COMMENTS
1			
2			
3			
4			
5			
6			

## JLEP SITE TRANSPORT AND STORAGE

none scarcely very a some a considerable alot a great an extreme almost all NOT  
any few few amount amount entirely SEEN

- 0 10 20 30 40 50 60 70 80 90 100 X
- 1. What proportion of transport routes are segregated from pedestrian routes**  
*Look for designated routes, refuges, and ssow*
- 0 1 2 3 4 5 6 7 8 9 10 X
- 2. What proportion of drivers are certificated**  
*Look for CIIB or equivalent certificates of competence*
- 0 1 2 3 4 5 6 7 8 9 10 X
- 3. What proportion of traffic movements are**  
*controlled by banksmen where required*  
*Look at movements interface with public*  
*Look at unloading operations*
- 0 10 20 30 40 50 60 70 80 90 100 X
- 4. What proportion of vehicles are well maintained and used safely**  
*Look at maintenance systems*  
*Look at condition of vehicles*  
*Look at use of vehicles*
- 0 10 20 30 40 50 60 70 80 90 100 X
- 5. What proportion of loco's are used safely**  
*Look for lights, signals, chains on wagons*  
*Look for safe systems of work for breasting*
- 0 10 20 30 40 50 60 70 80 90 100 X
- 6. What proportion of materials are managed and stored safely**  
*Look for management systems for materials*

ITEM	+	-	COMMENTS
1			
2			
3			
4			
5			
6			



## JLEP TUNNEL FIRE SAFETY

none	scarcely any	very few	a few	some	a considerable amount	alot	a great	an extreme amount	almost entirely	all	SLLN	NOT
<b>1. What proportion of workers have self rescuers within easy reach</b>												
0	10	20	30	40	50	60	70	80	90	100	X	
<b>2. What proportion of workers have used the tally system</b>												
0	10	20	30	40	50	60	70	80	90	100	X	
<b>3. What proportion of plant has fire suppression systems fitted</b>												
0	10	20	30	40	50	60	70	80	90	100	X	
<i>Look for water curtains on TBMs</i>												
<i>Look for extinguishers on TBMs</i>												
<i>Look for extinguishers on locos</i>												
<i>Look for extinguishers on other plant</i>												
<b>4. What proportion of stored or waste materials present within the tunnel are flammable</b>												
0	10	20	30	40	50	60	70	80	90	100	X	
<b>5. What proportion of workers carrying out hot work have followed permit system</b>												
0	10	20	30	40	50	60	70	80	90	100	X	
<b>6. What proportion of work locations</b>												
0	10	20	30	40	50	60	70	80	90	100	X	

ITEM	+	-	COMMENTS
1			
2			
3			
4			
5			
6			

## JLEP SPRAYED CONCRETE LINING

	none	scarcely any	very few	a few	some	a considerable amount	alot	a great	an extreme amount	almost entirely	all SEEN	NOT
	<b>1. What proportion of the SCL has layering, voids or poor compaction</b>											
0	10	20	30	40	50	60	70	80	90	100	X	
	<i>Look for evidence from cores and quality control systems</i>											
	<b>2. What proportion of the SCL has attained the specified thickness</b>											
0	10	20	30	40	50	60	70	80	90	100	X	
	<i>Look for evidence from cores and quality control systems</i>											
	<b>3. What proportion of reinforcement is of correct dimension</b>											
0	10	20	30	40	50	60	70	80	90	100	X	
	<i>Look for evidence from cores and quality control systems</i>											
	<b>4. What proportion of joints are correctly formed</b>											
0	10	20	30	40	50	60	70	80	90	100	X	
	<i>Look for evidence from cores and quality control systems</i>											
	<b>5. What proportion of tunnels have good face support systems</b>											
0	10	20	30	40	50	60	70	80	90	100	X	
	<b>6. What level of assessment is made of convergence results by management team</b>											
0	10	20	30	40	50	60	70	80	90	100	X	
	<i>Look for proportion of results reviewed</i>											
	<i>Look for review procedures</i>											
	<i>Look at emergency responses</i>											

ITEM	+	-	COMMENTS
1			
2			
3			
4			
5			
6			



## A2.2 UMIST Safety Climate Scale

If you think your manager is well informed about safety issues, you should say you agree or strongly agree depending on your strength of feeling. If however you feel that your manager is not well informed you should say you disagree or strongly disagree.

	<i>not relevant</i>	<i>highly disagree</i>	<i>disagree</i>	<i>not sure</i>	<i>agree</i>	<i>strongly agree</i>
	0	1	2	3	4	5
1] On this site, management is interested in your safety	0	1	2	3	4	5
2] On this site productivity comes before your safety	0	1	2	3	4	5
3] On this site the foreman encourages you when you work safely	0	1	2	3	4	5
4] On this site management comes down hard' on safety issues	0	1	2	3	4	5
5] On this site, your job is a dangerous one	0	1	2	3	4	5
6] On this site the foreman pressures you into working unsafely	0	1	2	3	4	5
7] On this site, the foreman criticises you for working unsafely	0	1	2	3	4	5
8] On this site, management 'turns a blind eye' on safety	0	1	2	3	4	5
9] On this site, you are often asked to rush your job	0	1	2	3	4	5
10] On this site, it is only a matter of time before you have an accident	0	1	2	3	4	5
11] On the site, workers who work safely try to make sure others appreciate it	0	1	2	3	4	5
12] On this site, you usually inform the foreman about safety hazards	0	1	2	3	4	5
13] On this site, management is willing to spend money and effort to improve safety	0	1	2	3	4	5
14] On this site, dangerous behaviour results in the foreman thinking bad of that worker	0	1	2	3	4	5
15] On this site, management knows about safety problems and quickly corrects them	0	1	2	3	4	5
16] On this site, our managers really care and try to reduce the levels of risk	0	1	2	3	4	5
17] On this site, your chance of involved in an accident is quite large	0	1	2	3	4	5
18] On this site, the safety problems in your job are very serious	0	1	2	3	4	5

- 19] On this site, management is to adopt new ideas for improving safety  
0 1 2 3 4 5
- 20] On this site, when a manager realises a hazardous situation has been found,  
he immediately attempts to put it under control  
0 1 2 3 4 5
- 21] On this site, workers who use protective equipment are not considered to  
be cowards but good and tidy workers  
0 1 2 3 4 5
- 22] This site is dangerous compared to other sites  
0 1 2 3 4 5
- 23] On this site being involved in an accident gives workers  
a bad reputation  
0 1 2 3 4 5
- 24] On this site, when a worker finds a dangerous situation in his work he reports it  
to the foreman  
0 1 2 3 4 5
- 25] On this site, people are likely to have accidents while doing the  
job you do  
0 1 2 3 4 5
- 26] On this site, when the foreman tells you about safety, you  
take it into consideration and behave accordingly  
0 1 2 3 4 5



### *A2.3 Leather's Construction Safety Attitude Scale*

If you think that the statement is correct state that you agree or strongly agree depending on your strength of feeling. If however you think the statement is incorrect state that you disagree or strongly disagree depending on your strength of feeling.

#### *Scores*

*1: Strongly Disagree*

*3: Uncertain*

*4: Agree*

*2: Disagree*

*5: Strongly Agree*

<i>Leather's Attitude Scale</i>	<i>Score 1- 5</i>
( 1) Safety is just a matter of people taking a little more care and thinking about what they are doing.	
( 2) Doing the same job day after day you forget the dangers and need someone to remind you of them.	
( 3) The more a man does a job, the safer he becomes.	
( 4) You are under pressure to follow the lead of your foreman on safety.	
( 5) Safety is more in the hands of the managers than your own.	
( 6) It's up to you if you take risks - the job doesn't force you to.	
( 7) Individual carelessness is the biggest cause of accidents.	
( 8) Safety is learnt from your experience of doing the job.	
( 9) The employer's attitude to safety is important; if they come down hard on safety, you can do too.	
(10) Your workmates have an important say in the degree of safety or danger in your job.	

**A2.4 UMIST Likelihood Attitude Scale**

If you think that there will always be an injury, when operatives use ladders with broken rungs, you should circle 100. However if you think there is no chance of an injury when operatives used ladders with broken rungs, you should circle 0.

none	v.low	q.low	low	fairly	mod.	q.high	high	v.high	ex.high	always
				mod.						
0	10	20	30	40	50	60	70	80	90	100

**For each of the questions below please indicate your response by circling the appropriate number.**

- |  |                                  |
|--|----------------------------------|
| 1 When operatives work without hard hats                                   | 0 10 20 30 40 50 60 70 80 90 100 |
| 2 When operatives throw down debris from heights                           | 0 10 20 30 40 50 60 70 80 90 100 |
| 3 When operatives use ladders which are not tied or secured                | 0 10 20 30 40 50 60 70 80 90 100 |
| 4 When operatives use ladders which are too short for the job              | 0 10 20 30 40 50 60 70 80 90 10  |
| 5 When operatives over-reach while working on ladders                      | 0 10 20 30 40 50 60 70 80 90 100 |
| 6 When operatives stand under a suspended load being lifted by a crane     | 0 10 20 30 40 50 60 70 80 90 100 |
| 7 When operatives drive park next to trenches                              | 0 10 20 30 40 50 60 70 80 90 100 |
| 8 When an unsecured load is moved around the site, on vehicle              | 0 10 20 30 40 50 60 70 80 90 100 |
| 9 When operatives drive too fast (ie, above site speed limit)              | 0 10 20 30 40 50 60 70 80 90 100 |
| 10 When operatives ride on plant which is not designed to carry passengers | 0 10 20 30 40 50 60 70 80 90 100 |
| 11 When there are walkways/access routes littered with debris/rubbish      | 0 10 20 30 40 50 60 70 80 90 100 |
| 12 When there are materials left stored or stacked unsafely                | 0 10 20 30 40 50 60 70 80 90 100 |
| 13 When there are openings left uncovered or unguard                       | 0 10 20 30 40 50 60 70 80 90 100 |
| 14 When operatives work on only one plank at heights >2 metre              | 0 10 20 30 40 50 60 70 80 90 100 |



**A2.5 Site Safety Interview Schedule (after Hinze, 1981)**

Y = yes      S sometimes      N – no

- (1) How many men are there usually in the gang you work with?  

0 - 7      8 - 14      14 +
- (2) Do you get on well with the guys you work with?  

Y      S      N
- (3) Do you enjoy working on this site?  

Y      S      N
- (4) Do you discuss personal problems with your workmates or do you keep them to yourself?  

Y      S      N
- (5) Do you ever have to compete with other workmen or other gangs on site?  

Y      S      N
- (6) How many months per year do you work on average?
- (7) Do you ever get set impossible deadlines to work to?  

Y      S      N
- (8) Do you often find yourself rushing to finish off work?  

Y      S      N
- (9) Have you, in the last five years, had an accident which has kept you away from work for more than 3 days?  

Y      S      N
- (10) How are you paid  

Dayrate      Jobrate      Basic + Bonus
- (11) Who do you think has the most control over your safety?  

You      The Foreman      The Company

**A2.6 Caribbean Construction Company Safety Management Interview Schedule**

- 1) COMPANY NAME
- 2) MAIN CONTRACTOR / SUB CONTRACTOR
- 3) PERSON SEEN
- 4) ANNUAL TURNOVER
- 5) TYPE OF ACTIVITY
- 6) CONTRACT TYPES  
Penalty clauses Invoked
- 7) EMPLOYEE TOTAL
- 8) PERSON RESPONSIBLE FOR SAFETY  
a) In Company  
b) On Site
- 9) COMPANY SAFETY POLICY OR FORMAL MANAGEMENT SYSTEM
- 10) SAFETY TRAINING GIVEN  
a) Directors  
b) Project Managers  
c) Site Managers  
d) Foreman  
e) Workers
- 11) PROJECT PLANNING:  
a) Project Time  
b) Subcon. Selection  
c) Safety Items  
d) Legal Requirements
- 12) MOST COMMON CAUSES OF INJURIES

	RANK
Falls	
Struck By	
Collapse	
Trip	
Exposure to Toxic Substances	



- 13) UNION RECOGNITION
  - Co-Operation
  - Joint Meetings
- 14) DO YOU APPLY STRONG PRESSURE RE: TIME and BUDGET
- 15) DO YOU ENCOURAGE COMPETITION BETWEEN GANGS
- 16) ACCIDENT DATA RECORDED
  - Accidents
  - D.O.
  - Near Miss
- 17) COSTS OF LABOUR VS. COST OF MATERIAL
- 18) PAYMENT OF LABOUR -
  - a) Day Rate
  - b) Job Rate
  - c) Other
- 19) THOUGHTS ON WORK CULTURE ON SITE

## A2.7 Union/Employer Organisation Interview Schedule

- 1 NAME
- 2 PERSON SEEN
- 3 MEMBERSHIP TOTAL  
ALL INDUSTRY  
CONSTRUCTION INDUSTRY
- 4 PERSON RESPONSIBLE FOR SAFETY
- 5 SAFETY TRAINING RECEIVED
- 6 SAFETY TRAINING GIVEN BY UNION
- 7 SAFETY REPRESENTATIVES
- 8 SAFETY COMMITTEES
- 9 DEGREE OF JOINT CONSULTATION ON  
CONSTRUCTION SITES
- 10 PERCEPTION OF LABOUR INSPECTORATE
- 11 PERCEPTION OF EMPLOYEES RE; SAFETY  
MANAGEMENT
- 12 PERCEIVED MAJOR HAZARDS TO MEMBERS

	RANK
Falls	
Struck By	
Collapse	
Trip	
Exposure	

- 13 ACCIDENT DATA AVAILABLE
- 14 CIVIL CLAIMS FOR WORK INJURIES TO MEMBERS
- 15 COMMENTS RE: WORK AND SAFETY CULTURE IN THE  
CARIBBEAN



## *A2.8 Caribbean Inspectorate Interview Schedule*

- 1) COUNTRY
- 2) PERSON SEEN
- 3) STAFF NUMBERS  
Inspectors  
Specialists  
Other
- 4) ORGANISATION
- 5) LEGISLATION ENFORCED
- 6) STATISTICS

	TOTAL EMPLOYEES	FATAL ACCIDENTS	> 3 DAY INJURIES
ALL INDUSTRY			
CONSTRUCTION			

- 7) ACCIDENT REPORTING REQUIREMENTS  
Estimate % under-reporting  
Compensation schemes
- 8) NATURE OF VISITS  
Appointments  
Spot Checks  
C.V./I.C./I.R.  
Follow up action
- 9) INSPECTION TECHNIQUES  
Check List  
Audits  
Std. Letters
- 10) DIVISION OF WORK:
- 11) FREQUENCY OF VISITS:
- 12) WORK RECORDING:

13) MAIN COURSES OF MAJOR ACCIDENTS

	RANK
Falls	
Struck By	
Collapse	
Trip	
Exposure	

14) ENTRANCE QUALIFICATIONS AND TRAINING  
REQUIRED

15) EQUIPMENT ISSUED

16) LEGAL POWERS  
prosecutions  
notices

17) COURTS AND PENALTIES

Cases Taken Nos/YR	CON.IND.	ALL IND

18) TRIPARTISM

19) STANDARD SETTING

20) TECHNICAL INPUT

21) MAIN AREAS OF CONCERN REGARDING  
OCCUPATIONAL HEALTH AND SAFETY

22) FUTURE DEVELOPMENTS  
Legislation  
Staffing  
Finance



***A2.9 JLEP Safety Management Audit Question Set***

**NAME:**

**JOB TITLE:**

1. What is your professional experience?
2. What is your job title and what are your responsibilities?
3. Who do you report to?
4. What is your role with respect to health and safety?
5. Are your health and safety responsibilities included in your job description?
6. How are you held accountable for your health and safety responsibilities?
7. How is your performance measured?
8. Are there performance standards or similar?
9. Are there review of appraisal systems to assess health and safety performance?
10. Are there any disciplinary procedures covering health and safety performance and if so when was the last time they were applied?
11. Do you have any conflicts during your health and safety responsibilities and what the job demands?
12. Does the safety policy document accurately reflect the attitudes and behaviours of directors and senior managers? Does it also reflect normal operating conditions?

**JLEP SAFETY MANAGEMENT AUDIT QUESTION SET**

**PLANNING AND IMPLEMENTATION**

1. Does the organisation follow TQM philosophies eg BS5750, ISO 9000 (etc)
2. Who is responsible for selecting contractors?
3. Who is responsible for controlling contractors?
4. What is your process of risk assessment?
5. What is your process of method statement preparation and use?
6. What training do people receive to ensure they have adequate skills in the above risk assessment and method statement process?
7. What do you consider to be the main hazards to which employees and contractors are exposed to on this contract?
8. How are you involved in monitoring and controlling contractors - are standards of safety performance set and monitored?

**COMMUNICATION**

1. How do you gain access to relevant health and safety information?
2. Is this readily available within your organisation?
3. How is relevant health and safety information brought to the attention of those people who need to know it?
4. Do you undertake health and safety tours?
5. Do you have face to face contact and discussions with contractors on health and safety issues?
6. Do you hold team briefings for contractors and subcontractors?
7. How does information regarding health and safety performance reach the top of the organisation?

**COMPETENCE**

1. What training have you had?
2. What further training have you been offered?
3. What further training do you think you require?
4. What is the general system for training?
5. What systems exist to ensure employees have received adequate health and safety training?
6. What systems exist to ensure subcontractors have adequate health and safety



training?

### **CO-OPERATION**

1. What involvement do you have in health and safety committees?
2. What systems are there for employees to communicate their safety ideas to management?
3. Do management systems promote and secure trust, participation and involvement of everyone?

### **MONITORING**

1. Do you conduct regular health and safety auditing?
2. What form does this auditing take?
3. What happens when imminent risk to individuals is found?
4. What checks are made by line management to ensure that quality and quantity of the operation of the active monitoring system?

### **REACTIVE MONITORING**

1. Is there an adequate reactive system to investigate accidents and incidents?
2. Who is responsible for operating this system?
3. When incidents are investigated does it ensure that the root causes of even just lost time events are identified?
4. What mechanisms are there to ensure that remedial action is taken following the results of investigations?
5. What analysis is carried out of the data to identify common failures, features and trends?
6. What checks are made by line management to ensure the quality and quantity of the reactive system?

Any further comments?

### *A2.10 Leather's Construction Safety Ranking Scale*

Please read the following statements regarding factors which influence site safety standards. Please rank these statements in order of importance, from 1-10; ie if you think safety training is the most important factor, rank it No.1; if you think it is the least important, rank it No.10.

<i>LEATHERS CONSTRUCTION SAFETY RANKING SCALE</i>	<i>RANK 1-10</i>
(1) A clean well organised site	
(2) Individual worker's care and awareness	
(3) A foreman who makes safety a priority	
(4) An effective safety officer	
(5) The company recognises safety as important	
(6) Adequate tools and equipment	
(7) Individual's experience of the work he carries out	
(8) Individual's feeling of contentment about working on the site	



## Appendix Three: Caribbean Results by Country

<b>Table A3.1 Caribbean Construction Projects: Most common activities, trades and plant</b>				
<b>Country</b>	<b>Sites</b>	<b>Site Activities</b>	<b>Trades</b>	<b>Plant and Equipment</b>
<b>Anguilla</b>	3	Groundworks, blockwork, painting	Labourers, masons, painters	Excavator, concrete mixing plant, mechanical cutters
<b>Barbados</b>	9	Groundworks, blockwork, roofwork, painting	Labourers, masons, roofers, painters	Concrete mixing plant, welding gear, mechanical cutters
<b>Guyana</b>	8	Blockwork, carpentry, painting	Labourers, masons, carpenters, painters	Excavator, concrete mixing plant, welding gear,
<b>Jamaica</b>	13	Groundworks, blockwork, concrete pouring painting	Labourers, masons, carpenters, painters, plant operators, steel fixers	Excavator, tower crane, mobile crane, concrete mixing plant, welding gear,
<b>Saint Lucia</b>	10	Groundworks, blockwork, concrete pouring painting	Labourers, masons, carpenters, steel fixers, plumbers, painters	Mobile crane, excavator, dumper, concrete mixing plant
<b>Saint Vincent</b>	6	Blockwork, carpentry, painting.	Labourers, masons, carpenters, painters	Concrete mixing plant
<b>Trinidad and Tobago</b>	10	Groundworks, blockwork, steel fixing, scaffolding, concrete pouring painting	Labourers, masons, carpenters, painters, plant operators, steel fixers	Mobile crane, tower crane, excavator, dumper, concrete mixing plant, welding gear.

### A3.1 UMIST Site Safety Audit: Caribbean Construction Site Results

#### *Trinidad and Tobago*

On the ten sites visited, housekeeping scores ranged between 97 and 73 with a standard deviation of nine. All the other categories were more variable with standard deviations over 20. Scores for the scaffolding category ranged between 30 and 100, with the maximum score being achieved on a site where only falsework with good base supports was present. Access to heights was generally good but variable. Sites with poorly constructed ladders with rungs nailed onto, rather than rebated and nailed into the styles, scored as low as 40. PPE provision was generally poor with one site scoring only five for this category.

<b>SITE</b>	<b>Housekeeping</b>	<b>Scaffolding</b>	<b>Ladder Access</b>	<b>P.P.E.</b>	<b>Site Score % Safe</b>
1	93.3	30	44	47	54
2	80	40	70	30	55
3	73	42	86	17.5	55
4	78	40	88	55	65
5	97	x	87.5	20	68
6	95	58	94	56.6	76
7	90	40	62.5	10	51
8	82	100	x	20	67
9	78	40	80	45	61
10	75	38	40	5	40
<i>sum</i>	<i>841.3</i>	<i>432</i>	<i>664.5</i>	<i>306.1</i>	<i>592</i>
<i>mean</i>	<i>84.13</i>	<i>48</i>	<i>73.83</i>	<i>30.61</i>	<i>59.2</i>
<i>std dev.</i>	<i>8.86</i>	<i>20.83</i>	<i>21.37</i>	<i>18.93</i>	<i>10.3</i>

Numbers of workers on site ranged from 28 to 101, the majority of whom were general operatives and masons. Seven out of ten principal contractors relied predominately on sub-contractor labour. The most common activities were wall construction, concrete pouring and scaffolding works. Concrete mixing plant was the most common item of plant on the sites studied. Two sites had tower cranes and two had dumper trucks operating on site. The number of supervisors on site varied between one and two. None of the sites had been visited by Labour Department inspectors.

#### *Saint Vincent and the Grenadines*

Six sites were audited using the UMIST site audit sheet in SVG. Three additional sites were visited but not audited because they were civil engineering works, or small scale house building projects which were not compatible with the sites audited in Britain in the UMIST



study. The sites audited included construction of offices, schools and a control tower and passenger terminal at the new airport on Union Island.

<b>Table A3.3 Site Audit Results - Saint Vincent and the Grenadines</b>					
<b>SITE</b>	<b>Housekeeping</b>	<b>Scaffolding</b>	<b>Ladder Access</b>	<b>P.P.E.</b>	<b>SCORE% Safe</b>
1	76	52	x	37	55
2	94	48	74	10	56.5
3	78	46	74	5	50.75
4	97.5	x	x	25	61
5	20	100	87.5	15	41
6	100	62	82	0	61
<i>sum</i>	465.5	308	317.5	92	325.25
<i>mean</i>	77.58	61.6	79.38	15.33	54.21
<i>std dev.</i>	29.96	22.33	6.6	13.66	7.55

Individual site safety scores ranged from 41 to 61 with a mean score of 54% safe. Housekeeping was generally good with an average score of 78%. Three sites scored above 90%, however, one poor site scored only 20 for this category. The lowest scoring item of the housekeeping category related to protection of openings. Ladder access was generally good, achieving a mean score of 79% safe. The lack of guard rails and toe-boards to scaffolding reduced scores for this category. PPE provision was poor on most sites with scores ranging between zero and 37% safe.

On many sites openings in floors and walls were left uncovered or unguarded. Working lifts on scaffolds had only single boards to work from, and toe-boards were generally absent. Guard rails were only occasionally provided to working places to prevent falls. Baseplates to both scaffolding and falsework were often absent. Ladders were often used without being tied or secured. Provision of protective footwear by the companies visited was rare, and few workers had their own. Most workers on the sites in SVG either wore casual shoes while some even worked in their bare feet.

Concrete framed buildings were the most common type of buildings constructed in SVG in 1992. Falsework consisted of wooden or bamboo props with plywood or corrugated metal sheets used as decking. There was a general lack of bracing and base restraints for falsework props, however, there was little chance of instability occurring during pours as concrete was moved by hand rather than by pump. Generally workers followed safe systems of work for fixing primaries and secondaries using step ladders or stagings to construct the formwork from below the deck level. Runway access for movement of materials to higher floors rather than using mechanical hoists, was common. Metal decking sheets used on steel framed buildings, were narrow and tack-welded onto the steel as opposed to shot-fired, which is common in Britain.

Numbers of workers on site ranged from four to 60, the majority of whom were general operatives and masons. Vincentian contractors employed labour directly, while the British contractor employed sub-contractor labour. The most common activities were wall construction and internal finishing works. Concrete mixing plant was the most common item of plant used on the sites studied. The number of supervisors on site varied between one and two. None of the sites had been visited by Labour Department inspectors.

*Barbados*

Nine sites were audited in Barbados which produced a mean site safety score of 59%. Individual site audit scores ranged between 44 and 72%. Housekeeping was the highest scoring category with a mean score of 81, followed by access with a mean score of 67% safe. Scaffolding and PPE were the lowest scoring categories.

Table A3.4 Site Audit Results - Barbados					
SITE	Housekeeping	Scaffolding	Access	P.P.E.	Site Scores % Safe
1	77	42	60	43	55.5
2	93	46	92	58	72.25
3	80	x	75	55	70
4	85	36	60	53	58.5
5	72	x	75	55	67.33
6	83	24	68	0	43.75
7	77	52	74	13.3	54.08
8	66	40	37.5	45	47.13
9	100	50	62.5	40	63.13
<i>sum</i>	733	290	604	362.3	531.67
<i>mean</i>	81.44	41.43	67.11	40.26	59.07
<i>stdev</i>	10	9.5	14.9	20.28	9.96

The construction of steel framed buildings with metal decking, was the most common construction method used on the projects studied. Three of the nine sites visited constructed concrete-framed buildings. Use of curtain walling systems was more common in Barbados than anywhere else in the Caribbean in the early nineties, which varied from pre-cast concrete panels to glass panels. Metal systems scaffolds and tower scaffolds were the preferred method of access, timber scaffolds were absent reflecting the lack of forested areas in Barbados.

The common use of system scaffolds is a characteristic of the Barbadian construction industry. The use of proprietary access systems, ie system scaffolds, while providing some beneficial aspects in terms of safety, caused problems in other respects, eg, the construction of supports to scaffold legs, and access to working platforms. Workers often had to climb up the scaffolds to get to the working areas because of the lack of ladders. Rigid ties between the building and system scaffolds were rare, the most common form of tie observed was the use of electrical wire, timber and nails. Loose blocks or metal supports were often placed under scaffold legs to level them.

The provision of PPE in Barbados was better than in most of the Caribbean countries studied. Standards varied from company to company, with one company supplying t-shirts, hats, masks, goggles and safety boots, while others merely provided an allowance for the purchase of boots by workers. Safety harnesses were present on almost every site but never seen in use. Managers in companies which issued safety boots stated that they often had difficulties getting workers to wear them because they would keep them at home or sell them.

The numbers of workers on site ranged from 28 to 101, the majority of whom were general operatives and masons. Seven out of ten principal contractors relied predominately on



sub-contractor labour. The most common activities were wall construction, concrete pouring and scaffolding works. Concrete mixing plant was the most common item of plant on the sites studied. The number of supervisors on site varied between one and two. None of the sites had been visited by Labour Department inspectors.

There was a lower level of mechanisation on sites in Barbados compared with Britain, but greater when compared with the majority of countries studied. Concrete mixing plant, welding equipment and grinding wheels were the most common pieces of plant seen. Two sites used hoists, one of which was a petrol driven mechanical builders hoist, the other a small electrically powered goods hoist used inside a building. The majority of the larger projects visited were nearing completion which further restricted the amount of plant used on sites.

### *Saint Lucia*

The mean score for the site audit results for the ten sites visited in St Lucia was 61% safe. The highest individual score for a site was 82%, with scores of 95% for housekeeping and 100% for scaffolding (achieved because the only item scored related to formwork base plates, all of which were in place). The lowest individual site score was 54. On all sites, housekeeping and access was particularly good with average scores of 82% for housekeeping and 83% for access. PPE of provision was generally poor with an average score of 26% and site scores ranging between 5 and 50%. The three sites managed by British contractors achieved less than the average site score for all the sites in St Lucia (scores are 62, 56, 59).

**Table A3.5 Site Audit Results - Saint Lucia**

SITE	Housekeeping	Scaffolding	Access	P.P.E.	SCORE% Safe
1	72	80	90	5	61.75
2	76.67	52	88	32.5	62.29
3	80	100	87.5	0	66.88
4	95	100	x	50	81.67
5	66.67	60	74	22.5	55.79
6	75	x	75	46	65.33
7	93.33	40	70	20	55.83
8	92	32	90	20	58.5
9	86.67	42	86	44	64.67
10	84	36	82	15	54.25
<b>Total</b>	<b>821.34</b>	<b>542</b>	<b>742.5</b>	<b>255</b>	<b>626.7</b>
<b>Mean</b>	<b>82.1</b>	<b>54.2</b>	<b>82.5</b>	<b>25.5</b>	<b>62.7</b>
<b>std dev</b>	<b>9.16</b>	<b>25.27</b>	<b>7.19</b>	<b>16.32</b>	<b>7.57</b>

The ten sites visited employed 469 workers, the largest site employed 115, while the average number of workers on site was 47. Sixty per cent of workers were employed directly by the main contractor. The most common site activities were wall construction, concrete pouring and painting. Tube and fitting, system, and wooden scaffolds were used for work at heights. Ladder access for scaffolds was often poor, guard rails and toe-boards were absent and working platforms were rarely fully boarded. Bamboo, timber, acro props, and a tunnel form system were all used as falsework and formwork systems. Two novel access platform systems were seen which, if the integrity of the welds could be assured, provided good safe access for

workers. The standard electrical supply within St Lucia is 220 volts. Step-down transformers were rare, however, three sites did have circuit breakers on the electrical distribution system.

The most common type of plant used by St. Lucian contractors was concrete mixing equipment. The three largest sites run by British contractors employed a wider variety and larger numbers of plant than St. Lucian sites. All British contractors employed cranes, excavators, and concrete pumping equipment on site, in addition to concrete mixing plant. On the majority of projects there was one site manager, however the maximum number of supervisors on site was three on the larger projects. None of the sites had been visited by Labour Officers or a safety officer. Three cranes were operating on one site, none of which had been thoroughly examined within the last 14 months, nor had a warning bell or ASLI system fitted. Cranes were present only on sites managed by British contractors. One builders hoist was seen in operation which was poorly guarded and poorly maintained. Public protection was generally good in the capital Castries.

### *Anguilla*

The three projects visited scored between 50% to 60% safe. Housekeeping on all sites was good with scores ranging between 70% and 90%. Scaffolding was particularly poor with each site scoring an average of only 20%. Access was variable ranging from 53% to 100%, while PPE provision was variable but often poor, ranging from 10% to 50% safe.

Table A3.6 Site Audit Results- Anguilla					
Site	Housekeeping	Scaffolding	Access	P.P.E.	Percentage Safe Score
1	90	20	53	38	50.25
2	83	20	100	50	51.25
3	70	20	100	50	60.01
<i>sum</i>	243	60	253	138	161.51
<i>mean</i>	81	20	84.33	46	53.84
<i>std. dev.</i>	8.29	0	22.16	5.66	4.38

Two of the three sites visited were projects managed by Anguillian clients who employed ten or less workers on site. A US/Moroccan client managed a number of sub-contractors, who employed 120 workers including trades such as roofers, tilers, and air conditioning engineers. General operatives and masons were the most common trades on site in Anguilla.

### *Jamaica*

The thirteen construction projects audited in Jamaica scored an average of 57% safe on the UMIST site audit tool. The highest individual site score, achieved by a British management contractor, was 73% safe, the lowest score was 43% safe. Housekeeping and access to heights were the highest scoring categories, with 71% and 79% respectively.

Scores for the housekeeping and scaffold categories produced standard deviations of 11 and 14 respectively. The access to heights and PPE categories were more variable with standard deviations over 20. Scores for the scaffolding category ranged between 18 and 60. Access to heights was generally good, but variable with scores ranging between 28 and 100. Low scores were recorded for sites where ladders were poorly constructed with the rungs just nailed onto, rather than rebated and nailed into, the styles. PPE provision was generally better in Jamaica



than other Caribbean countries with a mean score of 52 and individual site scores ranging from 20 to 92.

Table A3.7 Site Audit Results - Jamaica					
Site	Housekeeping	Scaffolding	Access	P.P.E.	Percentage Safe Score
1	72	26	65	48	53
2	74	50	93	50	67
3	82	40	100	50	68
4	63	30	74	50	54
5	84	40	84	80	72
6	84	40	85	20	57
7	75	x	73	20	33
8	65	38	40	20	40
9	50	18	43	65	44
10	60	66	66	92	71
11	68	40	28	50	46
12	62	66	80	40	62
13	85	52	75	82	73
<i>sum</i>	<i>924</i>	<i>506</i>	<i>906</i>	<i>667</i>	<i>740</i>
<i>mean</i>	<i>71</i>	<i>42.17</i>	<i>68</i>	<i>51.73</i>	<i>56.36</i>
<i>std dev.</i>	<i>11.37</i>	<i>13.91</i>	<i>20.44</i>	<i>22.69</i>	<i>12.72</i>

System scaffolds and tube and fitting scaffolds were more common than timber scaffolds in the urban centres. However timber scaffolds, runways and the use of bamboo supports for formwork were common in rural areas. Many timber access runways were fitted with guard rails. Jamaica can be likened to Trinidad and Barbados in respect of the level of mechanisation on site, with more cranes and hoists than on the smaller islands. Sites in Jamaica were more untidy than most other sites in the Caribbean reflected in the second lowest score in the housekeeping section of the site audit (71).

The low cost of labour and relative expense of construction machinery means that labour intensive manual handling is the norm in Jamaica. Human chains were often formed to move materials around site, eg, to pass buckets of concrete to pour a lintel. Walls were constructed with concrete blocks and rebar, and where free-standing, were often capped by a concrete beam cast *in situ*. On a steel frame factory unit, lengths of rebar were welded from the bottom to the top steel forming a curtain of steel which provided edge protection to the first floor slab before the blockwork was added.

The numbers of workers on site averaged 41 ranging from ten to 196, the majority of whom were general operatives, steel fixers and masons. The sites employed a total of 1054 workers, 60% of whom were employed by the principal contractor. The three largest projects of the 13 visited relied on sub-contract labour. The most common activities were wall construction, concrete pouring and ground works. Concrete mixing plant was the most common item of plant on the sites studied. Two sites had tower cranes and two had excavators operating on site. The number of supervisors on site varied between one and six. None of the sites had been visited by Labour Department inspectors prior to the researcher's visit.

### *Guyana*

Guyanese construction sites achieved an average site safety score of 42, the lowest in the Caribbean. Site scores ranged between 75% and 27% safe (table A3.8). Scaffolding, access to heights, and PPE all scored poorly with average scores below fifty% safe. Housekeeping was generally good with an average score of 69%, and scores ranging between 45 and 80%. Ladder access was variable with scores ranging from the minimum (0) to the maximum (100). PPE provision was generally poor, with the exception of two sites which scored 50 and 60%

The numbers of workers on site averaged 32 and ranged from 5 to 90, the majority of whom were general operatives, carpenters and masons. The sites visited employed a total of 259 workers, 50% of whom were employed by the principal contractor. The two largest projects of the eight visited relied on subcontract labour. The most common activities were wall construction, concrete pouring, welding and ground works. Concrete mixing plant was the most common item of plant on the sites studied. Three sites utilised excavators on site, no cranes were observed. The number of supervisors on site varied between one and three. None of the sites had been visited by Labour Department inspectors or safety inspectors prior to the researcher's visit.

**Table A3.8 Site Audit Results - Guyana**

SITE	Housekeeping	Scaffolding	Access	P.P.E.	SCORE% Safe
1	66.67	20	x	0	28.89
2	75	40	0	0	28.75
3	80	70	100	50	75
4	80	60	0	60	50
5	68	x	x	10	39
6	80	x	0	0	26.67
7	58.33	x	66.66	5	43.33
8	45	x	x	40	42.5
<i>sum</i>	553	190	166.66	165	334.14
<i>mean</i>	69.13	47.5	33.33	20.63	41.77
<i>std dev</i>	12.51	22.17	47.14	25.13	15.79



## A3.2 Caribbean Construction Company Safety Management Practices

### *Trinidad and Tobago*

Ten of the largest construction contractors in Trinidad and Tobago in 1992 were studied. The depth of the recession in the industry at this time is demonstrated by the fact that of these ten companies, two had no current work, and one company only had a small maintenance project. There was one foreign (British) company based in Trinidad and Tobago that had just finished one major job and was waiting for the next project to start.

The companies visited employed a total of 1,079 workers, representing approximately 7% of employment by private construction contractors. Nine directors, eight site managers and 18 manual workers were interviewed using the interview schedules and attitude scales. The annual turnover of the companies visited ranged between TT\$15 and \$20 million, the exception being the Government's Ministry of Works, which had an annual turnover of TT\$100 million (TT\$7:£1 in 1992). The value of works visited ranged between TT\$1 and TT\$70 million (see table A3.9). Project lengths ranged between 6 and 24 months with an average length of 15 months.

Client	Project Description	Value TT\$ million (£1:TT\$7)	Completion time (months)	Nº of Workers
Private	3 storey concrete frame offices	15	24	101
Public	3-5 storey concrete frame offices	7	24	54
Private	3 storey concrete frame offices	70	10	88
Private	2-3 storey concrete frame shopping mall	20	9	30
Public	concrete silos	40	12	50
Public	single storey concrete frame school buildings	1	6	20
Private	2 storey concrete frame offices	2	10	30
Public	1-3 storey concrete frame fire station	10	12	50
Private	2-3 storey concrete frame offices	11	10	28

All the companies visited were main contractors or project management contractors for new build construction works. Trinbagonian contractors generally had no formal safety management systems or safety policies. Exceptions, however, included a Caribbean subsidiary of a British contractor that had a copy of the parent company's safety policy, and one contractor who had a copy of a major British contractor's safety policy.

The foreman or site manager was usually considered the person responsible for safety. Workers and managers generally lacked any construction specific safety training, with the exception of civil engineers graduating from the Civil Engineering Department of the University of the West Indies. Works tended to be planned and scheduled within the parameters specified by the client. Project planning was generally limited to cost and materials supply, to the exclusion of safety issues. Health and safety legislation was not generally taken into account during the formation of tender bids. Safety items were only priced for if the works were considered to be of an unusual or difficult nature. Subcontractors were generally chosen



on local knowledge, and where this was not sufficient, financial reassurances and method statements were sought from subcontractors at the tender stage.

None of the companies visited officially recognised any trade unions on their sites. The companies visited made accident records for the purposes of insurance claims through the two workers' compensation schemes (National Insurance Scheme (NIS) and Workers Compensation Scheme (WCS)) but did not follow the reporting requirements under the Factories Act. None of the companies visited encouraged competition between individual gangs on site. However, all directors stated that they applied pressure to meet time and cost schedules. Management stated that they would tend to increase labour on site if the job was running late, rather than try and increase the productivity of the existing work force. No investment led, speculative ventures were being undertaken by the contractors visited within Trinidad and Tobago.

Penalties could be applied by the client via contract for delays, but this was rarely experienced within the industry. Contracts generally used bills of quantities and were settled by lump sum or cost plus payments. Design and build contracts were gradually becoming more common in the industry. The degree of control exercised by the principal contractor over subcontractors on site varied from company to company. Companies acting as main contractors often exercised little control over subcontractors, while project management contractors tended to exert direct control over the works of subcontractors. Site managers were generally the only company representative based on-site and controlled all site activities.

### *St Vincent and the Grenadines (SVG)*

Eight construction companies were listed in the Yellow Pages (1992) in St Vincent and the Grenadines, two of which were disconnected numbers. Six local companies, the Ministry of Works and two British construction companies were studied. Two retail companies that were managing the construction of new buildings for their own use declined to be involved in this study. Two of the construction companies visited also ran major building supplies operations. The nine construction companies studied (including the Ministry of Works) employed a total of 900 construction workers, which represents a quarter of the 1989 figure for paid employees in the construction industry. Five Directors, two Project Managers, one Engineer, one Site Agent, eight Foremen and 21 workers were interviewed. The annual turnovers of the local companies visited ranged between Eastern Caribbean (EC) EC\$1-20 million while the value of jobs visited ranged from EC\$150,000 to \$16.5 million (EC\$4.5:£1 in 1992). The total number of employees on the sites visited was 177, which represents five% of the 1989 figure of paid employees in the construction industry. The numbers of workers employed on the sites studied ranged between five and 60.

The companies included in this study were constructing new structures or carrying out refurbishment works on lump sum or cost plus contracts. Some of the contracts did not have time limits set for the completion of works. Penalty clauses had not been invoked on any contract operated by any of the SVG companies visited. Nine sites were visited in SVG, four were new build offices and retail premises, two were major house building projects and the remainder were infrastructure improvement projects including an external refurbishment of the main Post Office in Kingstown.

None of the companies had any safety organisation or had assigned any particular responsibilities for safety within the company. The foreman was always stated as the person being responsible for safety on site. None of the companies studied had prepared a safety policy nor had given any safety training to its employees. Safety items were not priced for unless specified in the bill of quantities. None of the companies were aware of the relevant legislation pertaining to construction operations but did provide welfare facilities and first aid equipment on site. All companies stated that they selected subcontractors from local



knowledge and that to come in on budget was more important than completing the project on time. Competition between gangs of workers on sites was not encouraged.

Table A.3.10 Sites visited in SVG by client, building type, value, project time and number of workers on site				
Client	Project description	Value EC\$ million (EC\$4.5:£1 in 1992)	Project completion time (months)	N° of Workers
Private	3-storey metal frame and decking extension	1	Not assigned	10
Public	2-storey concrete frame building	1	12	27
Private	3-storey concrete frame commercial building	Not fixed	18	15
Private	2-storey concrete frame commercial building	0.5	8	12
Public	External repairs to post office	Not fixed	Not assigned	8
Public	Construction of steel frame airport terminal	6	12	60
Public	Road improvement scheme	16.5	12	45
Private	Large concrete frame house	0.15	10	8
Private	Large concrete frame house	0.2	12	12

Accidents were reported for insurance claim purposes to the National Insurance Board but not for compliance with the occupational health and safety legislation. Personal protective equipment was not issued on an individual basis to workers but some hard hats were available on some sites, although these were stated to be mainly made available for visitors. None of the private sector workers belonged to a trade union but several of the workers from the Ministry of Works were members of the Commercial, Technical and Allied Union. All the directors of the companies studied stated that the cost of materials was greater than the cost of labour. They also stressed the importance of local work attitudes stating that the men were good workers but generally scored low in relation to productivity and high in their sense of independence.

There was little use of mechanised plant on construction sites in SVG, and where plant was present it was poorly maintained and guarded, eg, hoists and concrete mixers. Little use was made of chemicals in the construction process. Site electrical supply systems operated at 240 volts with circuit breakers fitted. The lack of available flat land in SVG particularly affects house construction. Hill slopes are excavated to produce two small areas of flat land one above the other. The floor slab is constructed on the upper flat area and extended and supported by concrete columns on the lower slope.

Site management in SVG consisted of the foremen who were totally responsible for the day-to-day running of all jobs. There were few specialist subcontractors in SVG and specialist steel erectors were brought in from Trinidad. Generally there were small numbers of men working on site. Due to the lack of an indigenous materials supply industry, builders in SVG need to import most building materials. The lack of suitable building sand caused problems due to the expense of importing appropriate building sand. Beach sand was sometimes used, leading to short lived structures due to salt corrosion. Time delays were experienced regularly on construction projects due to delays caused by the importation of materials and delays due to changes made by architects and clients, to the design.

## Barbados

In the 1992-93 Barbados telephone directory 42 building contractors are listed in the Yellow Pages. Of these companies 16 were contacted, nine were visited, and seven companies had little or no work on. The nine companies visited employed a total of 1,733 workers, equivalent to 20% of the 1991 employment figure of 8,500. By far the largest employer was the Ministry of Communications and Works, which employed 1,200 persons. The Ministry had experienced an almost 50% reduction in staff since 1990. One British owned subsidiary was operating in Barbados in 1992 and two companies owned by expatriates - one Canadian, one British. The annual turnover of the companies visited ranged from B\$1 million to B\$20 million (B\$3.2:£1 in 1992). The smallest contractor, a management contracting specialist, employed 25 people on average, while the largest private sector contractor employed 150 people. The sites visited ranged in value from B\$300,000 to B\$14m. The project length of jobs visited ranged from three months to five years. Numbers of workers on the sites visited ranged from six to 68. Twelve project managers and directors, ten foremen and site managers and eighteen manual workers were interviewed in Barbados. Steel frame buildings were the most common type of structures being built in Barbados in 1992.

Client	Description	Value \$ million Barbadian (£1:B\$3.2)	Project Length (months)	Workers on Site
Private <i>Speculative</i>	4 storey office block steel frame and decking, glazed cladding panels.	4	18	40
Private	4 storey office block steel frame and decking, concrete cladding panels	5	30	68
Private	Church with block work walls with composite metal roofing sheets	1.5	48	6
Private	3 storey office block, metal frame and decking, concrete cladding panels	5	12	30
Private	New roof using composite metal roofing sheets	0.3	3	4
Private	2 storey retail premises, metal frame and decking, blockwork walls	3	18	12
Public	2 storey concrete frame school building blockwork walls	6	24	45
Public	2 storey concrete frame school building blockwork walls	5	18	53
Public	Refurbishment of Parliament Buildings	6	60	17

Safety responsibilities were poorly defined within the companies visited and safety policies were totally absent. No safety training had been given to any member of staff of the companies



visited, although some men had received first aid training. Project planning was carried out in terms of cost, safety items only being priced if the works were of an unusual or difficult nature. Subcontractors were selected on local knowledge, but where works were of a difficult nature and specialist contractors were brought in from abroad, method statements would be asked for. All companies reported working to JCT (1980) competitive tender contracts, or occasionally fixed price works or even negotiated contracts. A steel cladding company also reported working to informal contracts and by letters of credit.

Two companies reported having penalty clauses imposed upon them, which occurred on the same job, and was said to be due to a difficult client. None of the other companies reported penalty clauses ever being invoked against them. All companies stated that the cost of materials was up to three times greater than the cost of labour on any job. Only one company officially recognised a union on its site, although 90% of the other companies paid the union rate. Welfare and first aid facilities were generally provided by every contractor, however, fire protection was generally poor. Health and safety legislation was generally not taken into account during the formation of the tender bid and little knowledge of the relevant legislation was noted amongst the persons interviewed.

Directors stated that accident records were only kept for the purposes of insurance claims through the national insurance scheme. None of the companies encouraged competition between individual gangs on site. Workers were paid predominantly by day-rates, although where feasible, job rates were paid. All companies stated that bringing the projects in on time and budget was important and if the job was running late they would increase the labour on site rather than try to increase productivity of the existing work force.

### *St Lucia*

Twenty-three construction companies were listed in the Yellow Pages (1992) under building contractors. Eight of these companies had no current work or had ceased trading. The National Insurance Scheme (NIS), however, had 70 companies registered, which included specialist contractors such as plumbers, electricians, etc. and small general contractors. Ten construction projects were studied in St Lucia, which included seven St Lucian contractors, two British and one joint St Lucian, Trinidadian and British contract. Two Trinidadian construction companies were also operating in St Lucia at the time of this study, but as both had been studied in Trinidad they were not included in this part of the study.

The projects visited included major new build works including multi-storey apartments, a shopping mall and an airport terminal. Sixty% of the projects visited had private sector clients (see table A3.12). Project lengths ranged between six and 20 months, while project values ranged between a quarter of a million and EC\$25 million. The numbers of workers on site ranged from ten to 115. The annual turnover of the ten companies studied ranged between EC\$0.5 million and EC\$2.5 million. The number of persons employed by these companies ranged from ten to 75. The ten companies visited employed a total of 365 people, representing eight% of the Statistical Office figure for the total number of persons employed in the construction industry in St Lucia in 1991 and 17% of 2165 construction workers who were registered with the NIS for 1990-91. This difference may give some indication the relative differences between formal and informal employment sectors of the construction industry, the informal sector being twice as large as the formal sector.



<b>Table A.3.12 Sites visited in St Lucia by client, building type, value, project time and number of workers on site</b>				
Client	Description	Value EC\$CI million	Duration (months)	Workers on Site
Private	Vertical concrete frame extension to shop	0.25	6	10
Public	3-storey concrete frame flats	19.5	16	115
Private	2 storey concrete frame housing	5	18	10
Private	2 storey steel frame and decking shopping mall	6	18	22
Public	2 storey concrete frame airport terminal	25	18	110
Private	Demolition and refurbishment of building	1.4	6	20
Public	3-storey concrete frame college	7.1	20	40
Public	Concrete water treatment works	12	15	40
Private	2 storey steel frame and decking industrial unit and offices	3	6	73
Private	2 blocks of 2-storey concrete frame holiday homes	2.5	18	40

Nine of the ten companies visited stated that both directors and foremen were responsible for site safety, whilst one British company stated that they delegated all safety management responsibilities to the foreman. Six of the seven companies visited were owner-run by a single director. All directors took an active role in site management. The only company that had a safety policy was a British company. The three British project managers were the only site managers who had received any construction specific safety training.

Most projects used standard contracts (FIDIC, JCT 1980 or RIBA) while two contractors stated that their jobs were run on a cost plus basis. No company had experience of penalty clauses being invoked against them, in spite of the fact that time delays were common on their jobs primarily due to materials and equipment supply problems and design changes. Project completion times were specified in 80% of the sites visited by either the client, quantity surveyor or contractors.

None of the companies visited recognised any formal union representation, although the two largest civil engineering companies on the island had long standing agreements with trade unions. All the directors interviewed stated that finishing projects on time and budget were both equally important and that a balancing act had to be carried out. When jobs were running behind schedule they stated that they would increase the number of men on site. No company encouraged competition between gangs of workers.

With regard to accident reporting, four companies had never experienced an accident and had no formal reporting procedures, while British contractors adopted British standard three-day reporting rule. All St Lucian companies were aware of the NIS scheme but were not aware of the reporting requirements under the health and safety law. Nine out of the ten companies visited stated that materials were a greater cost than labour. Seventy per cent of the companies visited stated that they paid workers a fixed rate, either per hour, per day or per week. Thirty per cent of companies operated a combination of schemes with fixed rates for certain work and piece-rate work introduced for simple masonry and carpentry work. One British company had tried to introduce a bonus scheme, which failed within a few weeks.



Six of the projects visited had private sector clients, while four projects were within the public sector. Public sector projects (values ranging from EC\$12 to EC\$25 million) were generally larger than private sector works (values ranging from EC\$0.25 million to EC \$7.1). Seven projects were building concrete structures while two were erecting steel frame structures metal decking flooring systems. The project length of the sites visited ranged from six to 20 months with an average of 14 months. The number of workers on site ranged from ten to 115 with an average of 48 workers on site.

Of the ten sites visited, only three utilised scaffolds. Both tube and fitting, system, and wooden scaffolds were seen. Access to scaffolds, the boarding out of working places and provision of edge protection to working platforms was generally poor. Bamboo, timber, steel acro props, and a tunnel form system were seen in use as falsework and formwork systems. Two novel access platform systems were seen which, if the integrity of the welds could be assured, provided good safe access for workers. The site electrical supply systems within St Lucia tended to operate at 220 volts with breakers fitted to the distribution board rather than using step- down transformers.

Three cranes were observed, which had neither been thoroughly examined within the previous 14 months nor had warning bells or Automatic Safe Load Indicator (ASLI) systems fitted. One builders hoist was seen in operation which was poorly guarded and poorly maintained. Public protection was, however, generally good with provision of protection to public access routes. BRITAIN contractors made significantly more use of subcontractors than did local companies. None of the sites had received any inspection from the Factory Inspectorate.

### *Anguilla*

Seven building contractors and one building company were listed in the Anguillian Yellow Pages in 1992. The national insurance scheme, however, had 119 employers registered, including self-employed persons and out of date records. Four major construction projects were active in Anguilla in 1992. Two Anguillian companies and one USA/Moroccan company conducted the three construction projects that were studied. These projects were under the direct day-to-day control of the client, who also acted as the management contractor or the main contractor.

Table A.3.13 Sites visited in Anguilla by client, building type, value, project time and number of workers on site				
Client	Description	Value	Project length (months)	Workers on site
Private	Redevelopment of existing hotel	US\$10m	24	160
Private	2-storey concrete flats	-	24	8
Private	2-storey steel frame and decking business centre	EC\$5m	12-36	10

Specialist workers were brought in from abroad to make up for skill and labour shortages in Anguilla. One local contractor who was used to build a new hospital caused delays to the project by a number of years due to a lack of expertise during the internal fit-out of the hospital. The three companies visited employed a total of 174 workers many of whom were non-Anguillian specialist subcontractors and tradesmen, eg, Moroccan tilers.

### *Jamaica*

The 1992 Yellow Pages for Jamaica lists over 100 building contractors and almost 50 general contractors, ten of which were listed in both sections. Twelve different main and management contractors were visited on 13 separate sites. The contractors visited included local branches of international companies, internationally operating British based companies, large local contractors and informal assemblies of workers brought together by the developer, client or supervisor. The majority of sites visited involved the construction of two-storey concrete frame buildings with blockwork walls. The average number employed on the sites visited was 78, average project length was 17 months, while the average project value was JA\$153 million (£4 million).

Table A.3.14 Sites visited in Jamaica by client, building type, value, project time and number of workers on site				
Client	Description	Value JA\$ million £1:JA\$40	Length months	Workers on Site
Private	2 storey school, concrete frame and block walls	30	24	56
Private	2 storey, steel frame, concrete frame and block walls	15	8	60
Private/ public	3-4 storey concrete frame and block walls	200	40	150, 25 women
Private	2 storey retail outlet, concrete frame and block walls	40	20	35
Private	6 storey concrete frame and block walls	-	24	66
Private	2 storey offices, concrete frame and block walls	10	15	86
Private	2 storey steel frame and decking factory	1	10	35
Private	2 storey concrete frame and block walls	40	-	10
Private	multi-storey offices concrete frame and block walls	805	24	60
Private	3 storey flats concrete frame and block walls	35	12	117, 18 women
Private	2 storey factory concrete frame and block walls	8	6	35
Public	Gas Turbine Plant steel frame and concrete block walls	600	8	193 7 women
Private	6 storey offices concrete frame and block walls	55	16	109

Safety responsibilities were not formally assigned to individuals within the companies studied, however, the foreman was generally cited as the person responsible on site for day to day safety matters. The one exception to this rule was a BRITAIN based company that had specifically designated a safety manager, had a formal safety management programme and had given its personnel formal safety training. The most common form of contract used was the Joint Consultative Committee for the Building and Construction Industry of Jamaica standard form with quantities (reprinted 1990). This building contract is based on JTC 1980 standard



form of contract from Britain. There were no safety clauses included in these contracts. The National Building Code of Jamaica (1983), based on British Standards, included in Appendix A, a list of hazardous materials and processes used in defining buildings as Hazardous Occupancy Buildings.

Workers were generally paid weekly, on a day rate or by number of hours worked. Job rates were often paid for larger scale shuttering and masonry work. None of the companies visited had permanent formal union representation but the larger sites are often unionised by ballot of the tradesmen on site. The two most powerful unions in Jamaica (BITU, NWU), were the only two unions actively representing construction workers. On the large scale contracts either or both unions negotiated official bargaining rights with the main contractor. Contract labour rates are agreed by joint consultation between these two trade unions and the Master Builders Association. The Labour Management Agreement 1993-1995, Building and Construction Industry, contains height payments if works are above 30 feet from the floor and depth payments for excavations deeper than seven feet.

No penalty clauses had been invoked on the contracts undertaken by the companies studied. Time delays were stated to be common due to design changes and problems of materials supply. Site managers stated that the time allocated for the completion of projects had reduced by up to six months over recent years. If jobs were running behind schedule all respondents stated that they would increase numbers of men on site. Competition between gangs was not encouraged on Jamaican construction sites. Materials were stated to be the major cost of any job with ratio to labour varying from 2:1 to 3:1.

Accident reporting to the Industrial Safety Division must be considered as poor as evidenced from their records for the construction industry compared with data from the National Insurance Schemes. The NIS data must also be considered as incomplete when even the President of the Master Builders Association stated that it was common practice for contractors to pay mens medical expenses themselves rather than bother with formal reporting procedures.

### **Guyana**

The Guyanese construction industry consists of relatively few contractors. In the 1994 Guyanese Yellow Pages there were listed 11 building contractors, 12 construction contractors, 13 engineering contractors and ten general contractors. Planning applications for commercial and residential properties received by the Central Housing and Planning Authority fluctuated between 2,687 in 1991 falling to 2,201 in 1992, and increasing to 3,100 in 1993. Eight of the largest construction projects in and around Georgetown were visited in Guyana. Seven of these projects were for private sector clients. Half of the projects studied were steel framed structures rather than concrete. Project values ranged from G\$12 million to G\$1.4 Billion(G\$200:£1).

No formal safety management techniques were employed by Guyanese construction companies. Only one foreign company had a safety policy document, which was stipulated in the pretender documentation by the client (Inter American Development Bank). Directors stated that Project Managers were responsible for safety and that project time lengths were set by negotiation with the client. Clients took a lead role in project management in Guyana with six out of eight works being directly controlled by the client. When setting the time period for the works, allowances had to be made for the weather (particularly during the rainy season) and availability of funds, as witnessed by several jobs in around Georgetown being left half finished.



<b>Table A.3.15 Sites visited in Guyana by client, building type, value, project time and number of workers on site</b>				
Client	Type of construction	Value G \$ million (£1 : G\$200)	Project length (months)	no of workers
Private	2 storey concrete frame and block walls restaurant	-	3	50
Private	3 storey concrete frame and block walls offices	12	9	18
Public	2 storey steel frame and block walls hospital	104	27	90
Private	single storey steel frame and block walls warehouse	75	13	40
Private	2 storey steel frame and block walls factory	175	30	53
Private	2 storey timber frame and walled accommodation	-	12	25
Private	2 storey concrete frame and block wall house	-	-	9
Private	single storey steel frame and block walls factory	805	2	24

FIDIC contracts predominated on the projects visited in Guyana. Legal occupational health and safety requirements were not considered or safety items priced for when preparing tenders. Subcontractors were chosen from local knowledge. Managers stated that there were strong pressures to complete projects on time and within budget. No penalties had, however, been invoked to the knowledge of the interviewees. One site tried to encourage productivity by the use of bonus schemes on site. Materials were stated to account for 2/3 of costs and labour 1/3 of costs. There was little unionisation in the construction industry in Guyana. Pay rates varied from G\$750 per day (£3.75) to G\$1500 (£7.50) per day depending on skills and the site concerned. Most companies paid weekly, however, one site paid fortnightly.

### *Caribbean building standards*

The Caribbean Uniform Building Code (CUBIC) is a code of practice for the construction industry applicable throughout the CARICOM region. Part 1 of CUBIC includes safety provisions for fire safety, housekeeping, health matters, inspections of hoists and cranes, scaffolding load capacities, etc. CUBIC requires, inter alia, that guard rails and toe boards be provided to all floors and wall openings within accepted engineering practice. Structural steel erection should not be advanced more than six floors ahead of the permanent floor construction and an entire tier should be planked over to form a crash deck for safe working below it. Site security should be provided by 2.4m hoarding or fence, which should be fully protected and lit. Sites within three metres of the street boundary or demolition works that are less than six metres away from the street boundary require protected pedestrian walkways. In 1992 in the Caribbean CUBIC tended to be used as a standard in cases of arbitration rather than as a standard to be followed by the construction industry during construction.



### A3.3 Summary Tables of the Characteristics of Caribbean Construction Projects

Table A3.16 Caribbean Construction Projects: General Characteristics						
Country	Sites Visited	Client (% Private)	Building Frame (% Concrete)	Building Height Ranges (Storeys)	Value Range (£ million)	Project Length (months)
Anguilla	3	100	100	2-3	0.5 - 6	12-36
Barbados	9	70	50	2-6	0.3 - 4	3-60
Guyana	8	90	50	1-3	0.1 - 7	2-30
Jamaica	13	95	85	2-6	3.75 - 20	8-36
Saint Lucia	10	60	90	2-3	0.06 - 6	6-20
Saint Vincent	6	50	70	2-3	0.25 - 4	8-18
Trinidad and Tobago	10	60	70	2-6	0.2 - 1	6-24
Total/Average	59	75	74	1-6	-	-

Table A3.17 Caribbean Construction Projects: Employment Characteristics				
Country	Sites Visited	Main Contractor Employees	Subcontractor Employees	Average Daily Pay Rates (£)
Anguilla	3	38	140	£11
Barbados	9	136	134	£10
Guyana	8	135	124	£5
Jamaica	13	618	436	£4
Saint Lucia	10	286	183	£12
Saint Vincent	6	73	55	£5
Trinidad and Tobago	10	203	284	£7.50
Totals	59	1,489	1,356	

Table A3.18 Comparison of Worker Samples by Trade	
Caribbean Sample n = 153	British Sample n = 94
53 carpenters;	15 carpenters;
40 masons	10 masons
24 labourers	21 labourers;
16 steel fixers	1 steel fixer
9 electricians	12 miners
other trades including welders, roofers and plant drivers.	other trades including welders, grouters, and plant operators

Table A3.19 Hinze Site Safety Schedule: Caribbean Results by Country (percentage agree)							
Paraphrased Items  <i>n</i> = 96	Anguilla  7	Barbados  16	Guyana  15	Jamaica  30	St. Lucia  18	SVG  10	Carib- bean Mean Scores 96
1) Work groups of seven or less	100	69	73	73	39	60	69
2) Get on well with other workers	100	100	100	100	100	100	100
3) Enjoy work	100	69	100	77	100	100	91
4) Discuss personal problems with others	100	-*	94	57	100	90	88
5) Don't compete with other workers	100	100	100	80	61	100	90
6) Work 12 months per year	86	75	33	80	61	-*	67
7) Don't experience impossible deadlines	72	71	60	30	89	90	69
8) Don't feel in a rush to finish work	57	-*	66	7	67	70	53
9) No accident in last 5 years	100	69	100	87	89	70	86
10) Paid by day rate	100	-*	93	93	95	-*	95
11) Self control over safety	100	56	100	93	78	100	88
* Items not on included on early versions of this scale							



## *Appendix Four: Construction Practices in the Caribbean*

One of the most visually striking differences between the two regions is the difference in scale of the urban centres and their structures. Buildings in the urban centres of the Anglophone Caribbean are low in comparison to those in Britain. Buildings taller than four stories are comparatively rare in the Caribbean, but increasingly common. Most high rise buildings are owned by foreign organisations or government. The competition for land in most urban centres has not yet reached the same intensity as in many cities in the world. As a consequence there are proportionally fewer high rise buildings in the Caribbean than in Britain.

Concrete framed buildings with concrete floors and reinforced blockwork walls was the most common construction method for new commercial buildings in the Caribbean. However, in the Caribbean in the early 1990s, the erection of steel-framed structures was increasing through out the Region. In the Caribbean the most common roofing material is corrugated metal sheets. Slates or asbestos cement sheets are rarely seen. Hip roofs predominate new roof construction with roof slope angles often less than those in Britain due to the importance of hurricane resistance as opposed to snow shedding. The construction of some sun shade features to buildings present significant risks of falls. Compared to Britain, there are fewer soft furnishings in finished buildings in the Caribbean which reduces the fire loadings and usage of chemicals in the construction process. Site security was usually provided to sites by hoardings constructed from galvanised metal sheets. Protected walkways, are often provided as public protection inner city sites.

### *Falsework and Formwork*

Concrete construction techniques utilise a system of moulds (formwork) and props (false work). The falsework used for supporting formwork during the construction of reinforced concrete structures in the Caribbean included proprietary metal systems, metal acro-props and site made hardwood-timber and bamboo props. Formwork systems used included proprietary systems such as metal tunnel forms, plywood decking sheets and corrugated galvanised metal sheets. Safe systems of work are generally adopted for falsework construction with the primary and secondary structural members positioned from a staging below the level of the form work deck. Edge protection is only rarely provided to working platforms.

Generally, provision of base supports or wedges to wooden props, was good with the exception of sites in Saint Vincent and the Grenadines. Props were placed at approximately one metre centres and were well laced and braced before the pouring of concrete took place. On all but the largest projects, concrete is mixed on site and put in place by hand rather than delivered by mixer truck and pumped into place. The most common construction technique in the Caribbean, (ie the floor by floor construction of insitu concrete frame and floor buildings), limits the potential for serious falls within the structure, when compared with steel frame erection.

### *Walls*

Walls in the Caribbean are generally constructed of a single skin of hollow blockwork with reinforcement bar and mortar placed inside the voids in the block. Concrete blocks consist of two hollow sections that make them relatively light and easy to handle unlike the solid concrete blocks used in Britain that often weigh over 20 kg. Five Newton hollow concrete blocks was common throughout the Caribbean. These blocks were six inches high, four inches wide and sixteen inches long and weigh around 10 kg Concrete blocks are the most common material

used for wall construction, however, hollow clay tiles are commonly used for non load-bearing walls.

Wall construction generally progressed by laying a row of blocks two or three high, then placing reinforcement bars into alternate voids in the blocks and filling them with mortar. Concrete blocks are subsequently added over the projecting reinforcement bars (or more rarely between the reinforcement bars by making holes in the walls of the each block) and then filling with mortar. A project manager from Britain stated that when filled with mortar and steel reinforcement bar, the blocks had a strength of 20 Newtons. Walls above ground level are constructed from the building's floor slabs, rather than from external scaffolds.



#### **Photograph A4.1 Wall Construction in Barbados 1992**

Horizontal metal lattice strips are often included in wall designs and concrete beams are often poured to cap off free-standing walls for earthquake and hurricane resistance. The use of steel reinforcement bar fixed to floor slabs or steel beams prior to the laying of blockwork and the use of timber profiles for giving a line to build to, (called cantelling in Saint Vincent and the Grenadines), both provide some limited protection to the edges of floor slabs during construction.

#### ***Ladders***

Caribbean ladders contrast with the industrially manufactured ladders common in Britain, including wooden pole ladders, or extendible aluminium or wood ladders and step ladders. The majority of ladders used on Caribbean construction sites are constructed on site from hardwood timber and rarely exceeded half the length of British industry standard access 30-foot pole ladder and can be up to twice as wide as them. Caribbean ladders are made for specific situations by the workers who use them. Styles commonly consist of four-by-two-inch lengths of hardwood timber with rungs rebated into the styles and nailed into position, or nailed in place with supporting blocks nailed onto the styles below them. Workers often use them as if they were a staircase, walking upright without the use of hands. Aluminium ladders are rare across the region, but more common in the more industrially developed countries. Access ladders in the Caribbean are usually fixed in position at the base and/or top by a timber restraint and are generally sturdy and convenient to use.

Edge protection is most commonly absent on working platforms and places, even at significant heights. Toe-boards or other measures to prevent the falls of materials are rarely provided to working platforms. However, materials are not commonly stored upon Caribbean working platforms. Ladder access is rarely provided to working platforms as access was often gained



from the floor slabs of the building or by climbing on the scaffold. However, most system tower scaffolds provided on sites in the Caribbean have integral ladders.



**Photograph A4.2 Cantelling Profile and Reinforcement Bar Providing Some Edge Protection in Saint Vincent 1992**

### *Working Platforms*

Working platforms generally consist of a single, two-inch thick or greater, hardwood plank, laid across timber supports or upon metal system tower scaffolds. Full boarding is rarely provided to working platforms. Hardwoods such as Pitch Pine and Teak are commonly used for working platform boards. The boards used for working platforms therefore tend to be thicker and made of more resilient timber than the average British scaffold board. The modulus of elasticity for Pitch Pine is 116.8 N/nm<sup>2</sup> as opposed to 85.4 N/nm<sup>2</sup> for Douglas Fir (CSO 1988). The construction of the frame on which these boards rested varies from proprietary metal trestles to site-made wooden support systems. Where tube and fitting scaffolds were seen they generally lacked sufficient transoms, facade-bracing, toe-boards and guard-rails, compared with British standards. In the Anglophone Caribbean scaffolds are used solely for light duty works such as rendering and painting. Timber was commonly used to construct tower scaffolds..



**Photograph A4.3 Wooden Tower Scaffold in Guyana 1992**

### ***Plant and Equipment***

There is less mechanisation of the construction process in the Caribbean compared with Britain primarily because the cost of importing and maintaining machinery is high while the price of labour is relatively cheap. Cranes and hoists on Caribbean sites tend to be poorly maintained due to problems of obtaining spare parts. There are few pneumatic or electric tools used on sites in the Caribbean compared with Britain. The most common piece of plant found on Caribbean sites was concrete mixing plant followed by mechanical cutting equipment and mobile cranes. The future use of mechanised plant, equipment and tools will inevitably increase in the Caribbean.





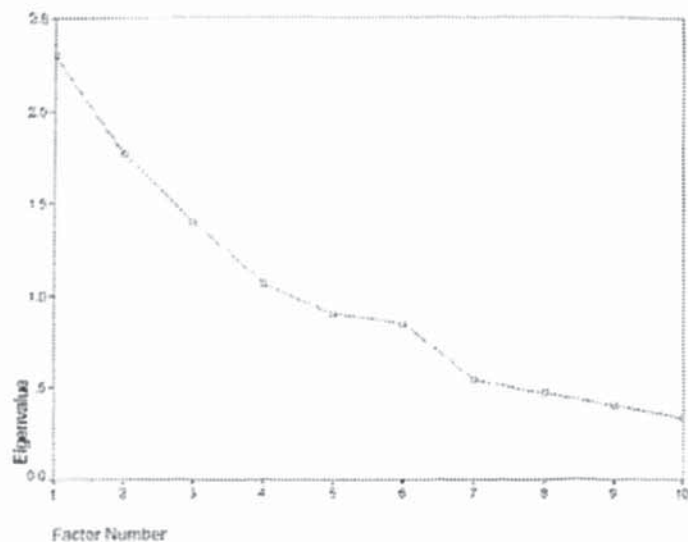
**Photograph A4.4 Poorly Guarded Builders Hoist in Barbados 1992**

Of the 59 sites audited in the Caribbean only nine used mobile cranes, four had tower cranes, seven used dumper trucks and two used concrete pumping equipment. Plant driver training was provided by a Government run scheme in Trinidad and Tobago. Plant and machinery are often brought in from hire companies who carry out their own maintenance and provide their own drivers. National electrical systems operated at voltages ranging between 240 and 110 volts. Inspections of the electrical supply system by Electrical Inspectors took place in most Caribbean countries.

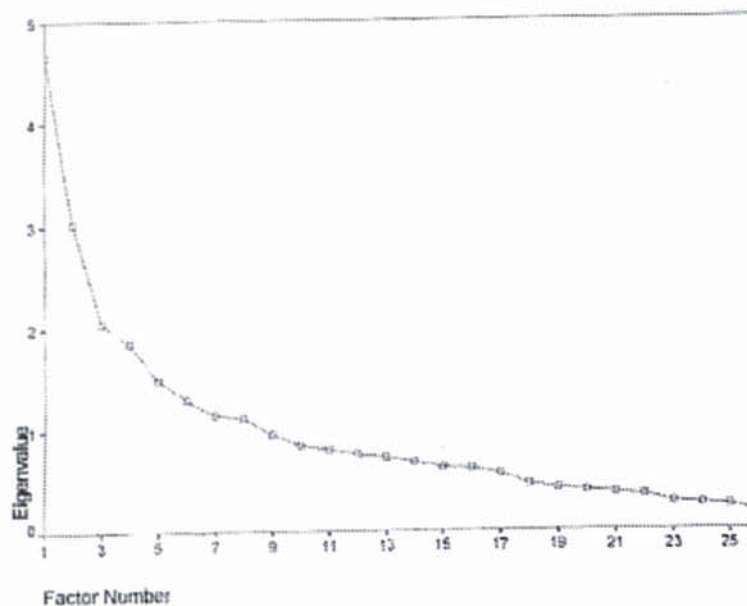
Good site safety practices observed included blocking off of staircases on which work was being undertaken, welding of guard rails to decking before concrete works began and use of open-ended oil drums joined together to form both a rubbish chute and as a chimney to a tar boiler for a roofing job. Staircases were usually clean and handrails were put in early in the construction process. Welfare and changing facilities were provided on the majority of sites visited.

## *Appendix Five: Safety Climate Scree Plots*

### **A 5.1 Caribbean Sample - Scree Plot Leathers Attitude Scale**

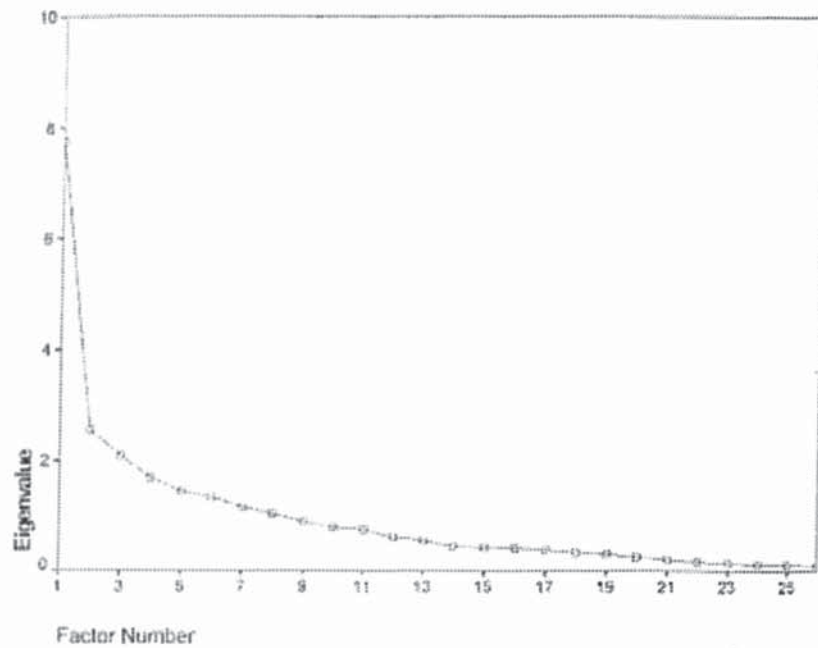


### **A5.2 Caribbean Sample - Scree Plot for UMIST Safety Climate Scale**





**A5.3 British Sample - Scree Plot for UMIST Safety Climate Scale**



**A5.4 Combined Sample - Scree Plot for UMIST Safety Climate Scale**

